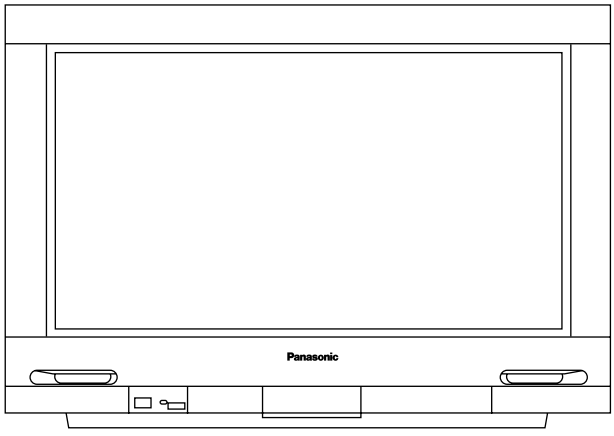
ORDER NO.ITD9906011C1
B2

Service Manual

Color Video Monitor

CT-34WDM60

HD6M Chassis



The service technician is required to read and follow the “Safety Precaution” and “Important Safety Notice” in this service manual.

Specifications

Power Source
AC120V, 60Hz

Power Consumption:
Normal use: 214 W (Maximum Current: 3.3A)
Stand-by condition: 0.35W

CRT
34-inch, 16:9 aspect ratio (Viewing area)

Applicable signals
Color system : NTSC

Screen size
29.36”(745.9mm)(W)x16.5”(419.5mm)(H)x33.68”(855.7mm)(D)

ANODE Voltage
32.5kV max.

Accessories Supplied
Remote control TNQE192
Battery (2xR6 (AA) Size)

Speaker Out
21W(7W(R)+7W(L)+7W(C))
Impedance 8Ω

Dimension (WxDxH)
34.4”(874mm) x 23.15”(588mm)x25.1”(637mm)

Weight (Mass)
180.8lbs (82kg) Net

Connection terminals

AV INPUT 1-4 VIDEO 1.0Vp-p (75Ω)
(Phono Jack Type)
(INPUT3 has no S-VIDEO terminal)
S-VIDEO Y:1.0Vp-p (75Ω)
C:0.286 Vp-p (75Ω)
(Mini DIN 4-pin)
AUDIO L-R 0.5 Vrms
(Phono Jack Type x 2)

AV PROG. OUT
VIDEO 1.0Vp-p (75Ω)
(Phono Jack Type)
S-VIDEO Y:1.0 Vp-p (75Ω)
C:0.286 Vp-p (75Ω)
(Mini DIN 4-pin)
AUDIO L-R 0.5 Vrms
(Phono Jack Type x 2)

TO AUDIO AMP
AUDIO L-R 0.5 Vrms
(Phono Jack Type x 2)

COMPONENT VIDEO
Y 1.0 Vp-p (including synchronization)

INPUT1-3
P_B/P_R ± 0.35 Vp-p
AUDIO L-R 0.5 Vrms
(Phono Jack Type x 2)

COMPONENT VIDEO
Y 1.0 Vp-p (including synchronization)

PROG. OUT
P_B/P_R ± 0.35 Vp-p
AUDIO L-R 0.5 Vrms
(Phono Jack Type x 2)

Design and Specifications are subject to change without notice.
Weight and Dimensions shown are approximate.

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⚠ WARNING

This service literature is designed for experienced repaor technicians only and is not designed for use by the general public.
IT does not cotain warmins or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service literature by anyone else could result in serious injury or death.

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SAFETY PRECAUTIONS

General Guidelines

1. It is advisable to insert an isolation transformer in the AC power line before servicing a hot chassis.
2. When servicing, observe the original lead dress, especially the lead dress in the high voltage circuits. If a short circuit is found, replace all parts which have been overheated or damaged by the short circuit.
3. After servicing, see to it that all the protective devices such as insulation barriers, insulation papers, shields, and isolation R-C combinations, are properly installed.
4. Before switching the power on, measure the resistance between B+ line and cold side chassis ground. Connect the "-" side of an ohmmeter to the B+ line, and the "+" side to chassis ground. Each line must have more resistance value than the specified one as follows:

B+ line	Minimum Resistance
208V(TPD43)	10kΩ
130V(TPD53, TPD55)	10kΩ
23V(TPD57,58)	3kΩ
15V(TPD60)	5kΩ
6V(TPD43,45)	50kΩ

5. When the set is not used for a long period of time, unplug the AC power cord plug from the AC line outlet.
6. High voltage points, as high as 36 ± 0.2 kV, are present when the set is in operation. Operating the set without the rear cover involves in a dangerous electrical shock from the set power supply. Servicing must not be attempted by anyone who is not thoroughly familiar with the necessary precautions when working on high voltage equipment. Always discharge the anode of the picture tube to chassis ground before handling the picture tube.
7. After servicing, make the following leakage current checks to prevent the customer from dangerous electrical shock.

Leakage Current Cold Check

1. Unplug the AC power cord and short between the two prongs of the AC plug with a jumper wire.
2. Set the power switch of this set to ON position.
3. Measure the resistance value with an ohmmeter between the shorted AC plug and each exposed metallic part of the set cabinet such as screwheads, connectors, and control shafts. When the exposed metallic part has a return path to the chassis, the reading should be more than 1 MΩ.
   When the exposed metal part does not have a return path to the chassis, the reading must be infinity.

Leakage Current Hot Check (See Fig.1)

1. Plug the AC power cord directly into the AC line outlet. Do not use an isolation transformer for this check.
2. Connect a 1.5kΩ, 10W resistor, in parallel with a 0.15μF capacitor between each exposed metallic part of the set and an earth ground such as a water pipe.
3. Use a high impedance AC voltage meter to measure the voltage across the resistor.
4. Measure the voltage at each exposed metallic part.
5. Reverse the AC plug inserting direction at the AC line outlet and repeat each of the above measurements.
6. The voltage at any point must be less than 0.75Vrms.
7. A leakage current tester (Symptom Model 229 or the equivalent) may be used to make the hot checks. In this case, the current must be less than 500μA.
8. If the reading is more than the above value, the set must be repaired and rechecked before it is returned to the customer because of a possibility of an electrical shock.

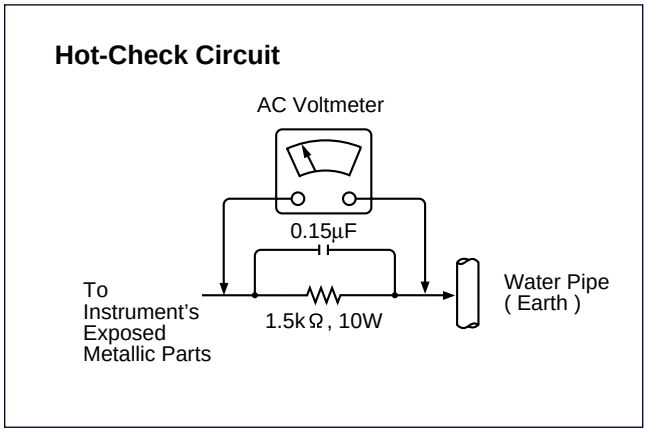


Fig. 1

X-Radiation

WARNING:

1. The potential sources of X-Radiation in the monitor set are the high voltage section and picture tube.
2. When using a picture tube test jig for service, make sure that jig is capable of handling 32.5kV without causing X-Radiation.
3. For continued X-radiation protection, in case that at least one of the components listed below is replaced, follow the adjustment procedure of the high voltage circuit. Precise adjustment is necessary for R581 to protect X-Radiation. Refer to "High Voltage and X-Radiation Protective Circuit Adjustment section".

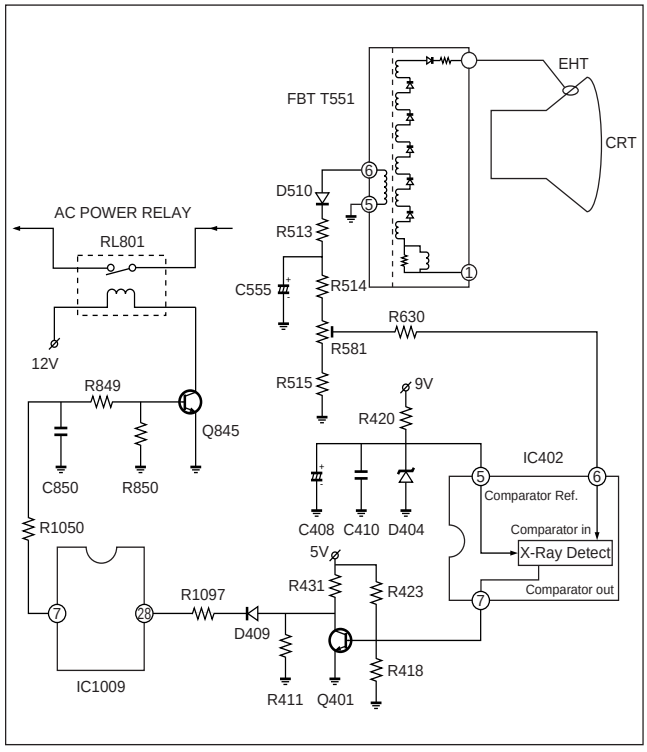
   T551, IC402, IC1009, D409, D404, D510, R513, R514, R515, R581, R411, R418, R423, R431, R849, R850, R105, R1099, C408, C410, C555, C850, RL801

HOLD DOWN OR SAFETY CIRCUIT INFORMATION

To monitor the high voltage, the positive DC voltage from the cathode D510 is applied through R595 and other resistors to pin 6 of IC402, which is the input terminal of the X-ray Protection Circuit. The voltage at pin 6 of IC402 is adjusted by R581 same voltage at pin 5 of IC402 with high voltage is 36kV. Under normal conditions this voltage is insufficient to activate the X-ray Protection Circuit.

If the high voltage increases over the specified voltage, the voltage at pin 6 of IC402 increases and causes the X-ray Protection to activate. Then it causes the shut down works.

In the process described above, the voltage at pin 6 of IC402 is compared with the voltage at pin 5 of IC402 which is basically a constant voltage fed from the Zener Diode D404. If excessive beam current is drawn, the voltage at pin 6 of IC402 increases. When the voltage at pin 6 of IC402 over the voltage at pin 5 of IC402, the voltage at pin 7 of IC402 becomes “high” and feeds into Base of Q401, and the voltage at Corrector of Q401 becomes “high” and feeds into pin 28 of micro-controller IC1009 through D409 and R1097. The micro-controller then turns off Q845, causes the AC power relay RL801 to unlatch and turns off the receiver.



Service Instruction: Procedure to apply silicone to the seal control R580

Purpose

To prevent any adjustment on the sealed control after final adjustment is done at factory. If the sealant are removed for any reason, the control is damaged at same time.

Material

1. Silicone-Type T8C1710201H, manufactured by Shin-Etsu Chemical Co., Ltd. (Japan)
2. Hard ABS tube-Type TMMX004

Tools

No tool is required.

Procedures

1. Place the hard ABS tube on the designated sealed control,
   as shown in Figure a.

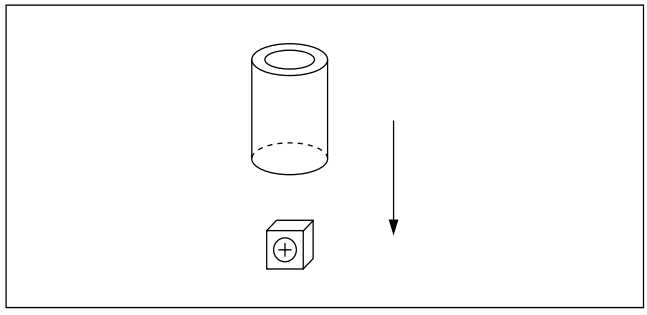


Figure a.

2. When the tube is gently pressed all the way down and adhere to the P.C.B., apply the silicon into the hard ABS tube and form hemisphere like object on the top of tube, a shown in Figure b.

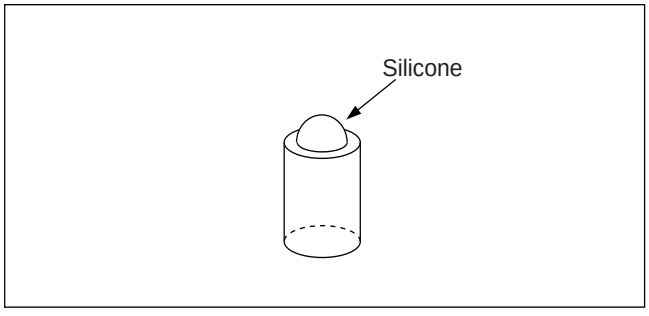


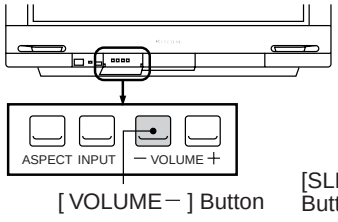
Figure b.

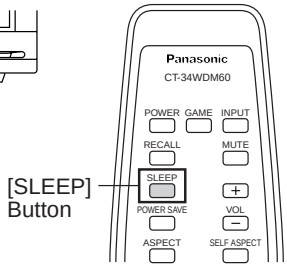
Self-check Function

When symptoms like "the power fails sometimes" or "sometimes there is no picture and/or sound" can not be confirmed at the time of servicing, the self-check function can be used to confirm the occurrence and to find the defective circuit.
In case of "power failure", flashing of the "VIDEO IN" indication (red) at the front of the unit can be used to narrow down the +B line.

Self-check of the microcomputer control system (bus line)

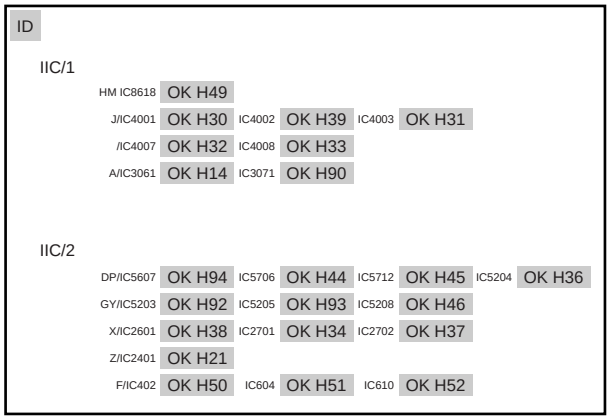
Indication method	Screen display





<Indication method>
Input a 1080i signal or NTSC Signal, press the SLEEP button on the remove control simultaneously with the "VOLUME -" button on the unit. (The display will be switched to the screen of VIDEO 1 and the screen shown on the right will be displayed.)

<Return to the normal screen>
Return to the normal screen will be made by POWER or any other remote control operation.



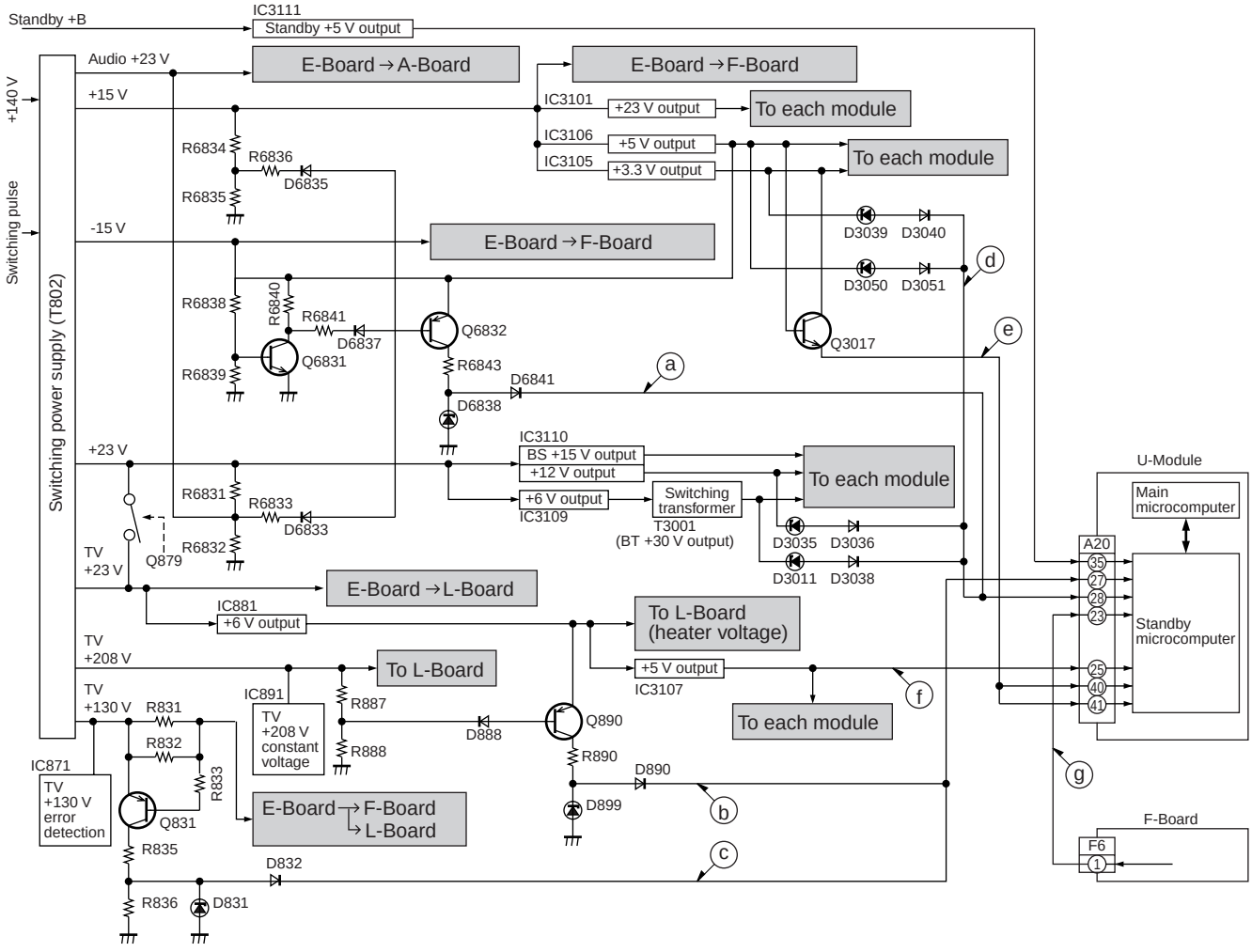
Check result of IC
"OK" → Normal
"NG" → Abnormal
(Check IC or its nearby components)

Display Contents

Indication No.	Symptom, status	Treatment method	Applicable Board, applicable Module
H14	BBE and LED does not work.	Exchange IC3061.	A-Board
H90	Picture and/or sound can not be adjusted.	Exchange IC3071.	
H21	No sound	Exchange IC2401	Z-Board
H30	Video input is not possible.	Module exchange	J-Module
H31	Video input is not possible.		
H32	No sound and No picture		
H33	No video from component (color difference) input		
H39	Sound switching is not possible.		
H34	No video, defective OSD	Module exchange	X-Module
H37	Defective OSD		
H38	No video, defective OSD		
H36	The NTSC signal is displayed, but the 1080i signal is not displayed.	Module exchange	DP-Module
H44			
H45			
H94			
H46	No NTSC video	Module exchange	GY-Module
H92			
H93			
H49	Synchronization not possible	Module exchange	HM-Module
H50	Horizontal and vertical synchronization not stationary	Exchange IC402.	F-Board
H51	Earth magnetism compensation does not operate.	Exchange IC604.	
H52	The servicing item "distortion correction" does not operate.	Exchange IC610.	

Self-check for the power supply system

(1)Block diagram of the power supply system



● This unit is equipped with a protector circuit for the case when the +B line on the secondary side of the switching power supply is short-circuited at all times.

● Abnormalities are detected for seven +B lines per switching power supply.

Operation for detection of abnormalities

(1) Lines ⓐ , ⓑ , ⓒ , and ⓖ in the above figure

- The collector of each transistor for detection of abnormalities becomes "H", and a voltage of about 2.5 V or about 5.0 V is impressed to the microcomputer.

(2) Line ⓓ in the above figure

- Abnormality detection for each regulator output voltage is performed by Zener diode and protection ON/OFF diode.
- When the regulator output voltage rises, the withstand voltage fault voltage is applied to the Zener diode, the protection ON/OFF diode is switched to ON by this fault detection, and a voltage of about 5.0 V is impressed to the microcomputer.

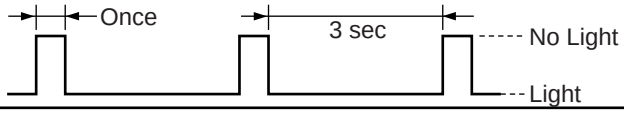
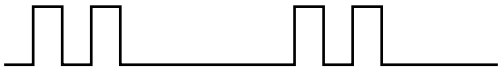
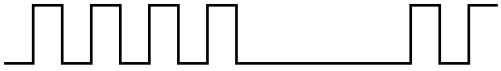
(3) Lines ⓔ and ⓕ in the above figure

- The lines ⓔ and ⓕ both are the reset input voltage for the standby microcomputer, and when this input voltage is not provided as input to the standby microcomputer, the fault detection operates.

- When fault detection operates, the microcomputer switches the relay of the switching power supply to OFF.
- When the power has been cut off by the power supply protector (or by detection of abnormal high voltage), the "Power supply/function standby/video reception" LED at the front of the unit flashes one to seven times at the time of power supply protector operation (detection of abnormal high voltage) to facilitate discrimination of the fault location.

(2)Flashing timing table

When an abnormality has occurred for a power supply line, the protection circuit (power supply protector/detection of abnormal high voltage) operate and cuts the power supply. At this time, the defective line can be identified by the number of flashes (red) of the "Power supply/function standby/video reception" indication at the front of the unit by means of the fault line which has operated the protection circuit.

Flashing	Flashing timing	Contents
Once		CRT drive +32 kV voltage rise (ⓖ)
Twice		RGB drive +208 V, vertical drive -15 V voltage drop (ⓑ)
Three times		+5 V voltage drop (ⓔ)
Four times		Vertical drive +15 V/ -15 V, +23 V/audio +23 V voltage drop (ⓐ)
Five times		+15 V/+ 12 V/+9 V/+5 V /+3.3 V/BT +30 V voltage rise (ⓓ)
Six times		+3.3 V voltage drop (ⓕ)
Seven times		+130 V overcurrent detection (ⓒ)

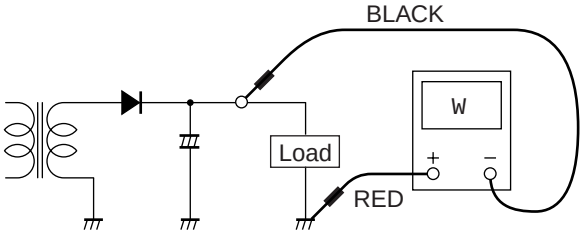
*Other than the above, the contents partly may differ according to the fault location.

- Flashing twice: +6 V voltage drop (-> refer to the flowchart on page 9)
- Flashing three times: +6 V voltage drop (-> refer to the flowchart on page 10)
- Flashing four times: +130 V/+208 V voltage drop (refer to the flowchart on pages 11 and 12)
- Flashing five times: +23 V voltage drop (-> refer to the flowchart on page 9)
- Flashing six times: +15 V/+23 V voltage drop (refer to the flowchart on pages 13 and 14)

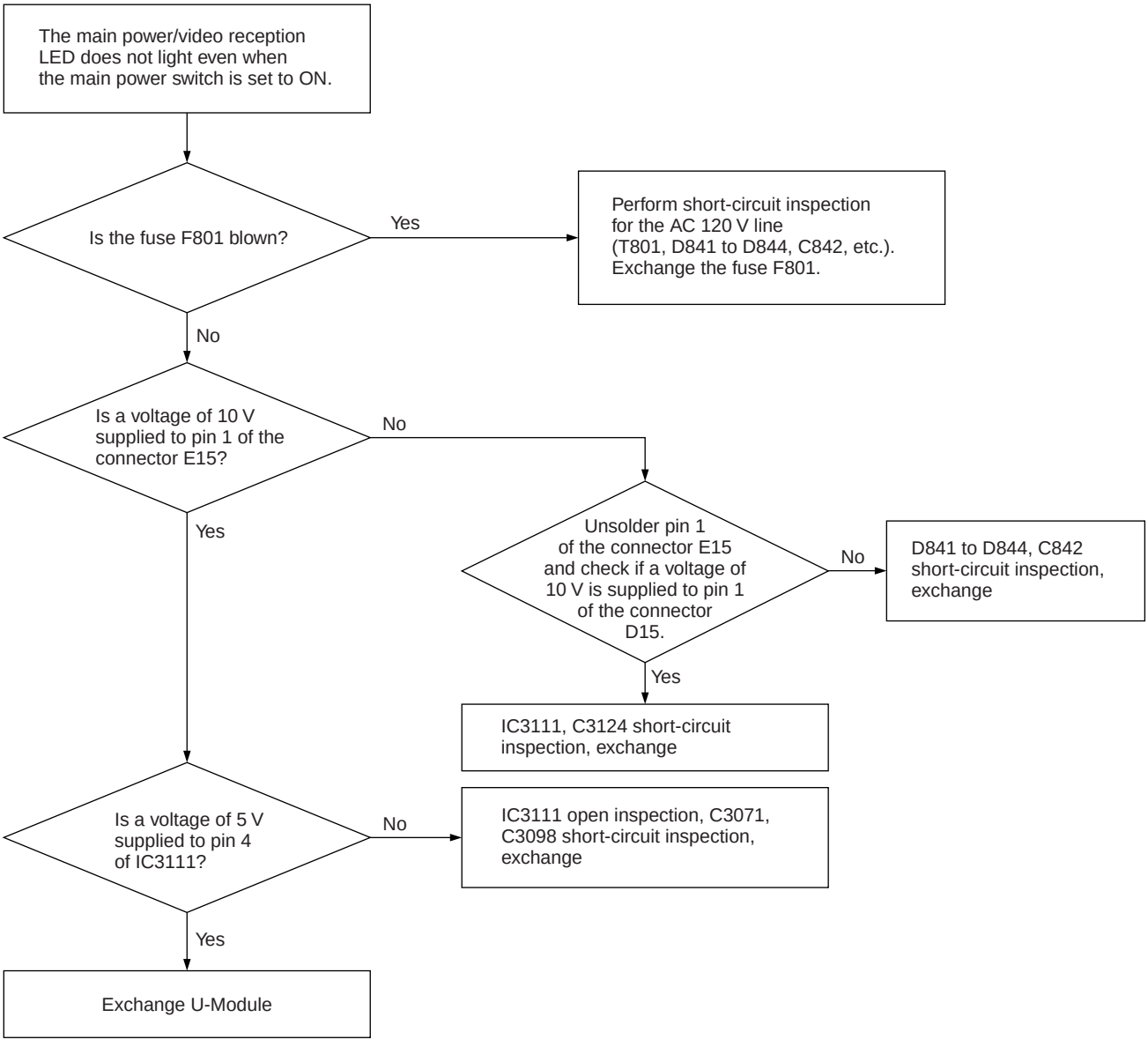
Inspection procedure using the self-check function for the power supply system

Caution items at the time of inspection

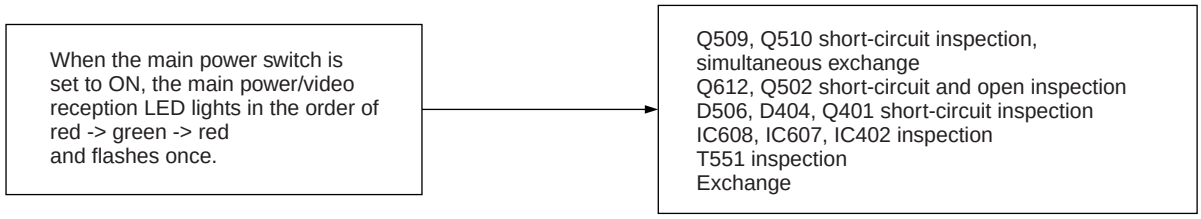
- Always pull the plug of the AC code before performing a continuity check.
- When solder has been removed or a connector has been pulled, please restore the original condition after each inspection.
- When the tester has been set to Ω a voltage with the opposite polarity of the voltage impressed when the tester is used as a voltmeter is put out from the tester, and for inspection of a load short-circuit, connect the tester rod on the plus side (red) to earth and the tester rod on the minus side (black) to the power supply line.
- Generally, a value of 10 Ω or less can be considered as a load short-circuit.



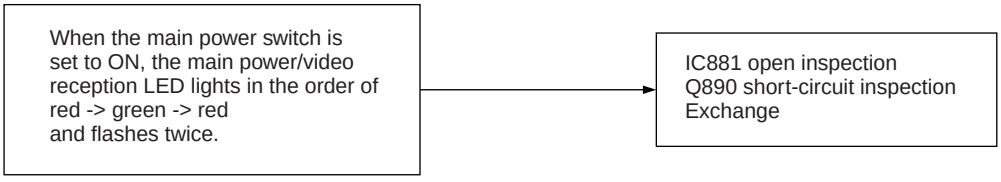
The main power/video reception LED does not light.


The main power/video reception LED does not light even when the main power switch is set to ON.
Is the fuse F801 blown?
Yes
Perform short-circuit inspection for the AC 120 V line (T801, D841 to D844, C842, etc.). Exchange the fuse F801.
No
Is a voltage of 10 V supplied to pin 1 of the connector E15?
No
Yes
Unsolder pin 1 of the connector E15 and check if a voltage of 10 V is supplied to pin 1 of the connector D15.
No
D841 to D844, C842 short-circuit inspection, exchange
Yes
IC3111, C3124 short-circuit inspection, exchange
Is a voltage of 5 V supplied to pin 4 of IC3111?
No
IC3111 open inspection, C3071, C3098 short-circuit inspection, exchange
Yes
Exchange U-Module

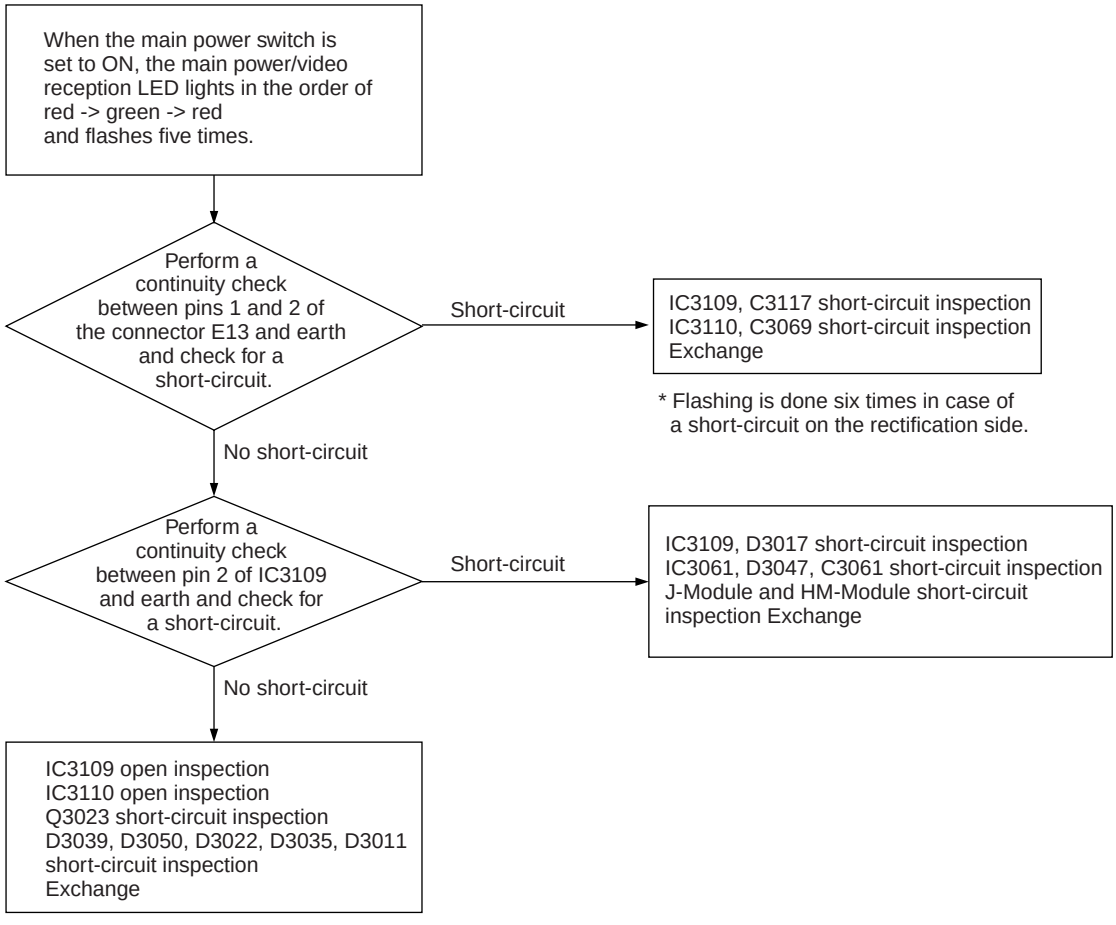
Main power/video reception LED flashes once


When the main power switch is set to ON, the main power/video reception LED lights in the order of red -> green -> red and flashes once.
Q509, Q510 short-circuit inspection, simultaneous exchange
Q612, Q502 short-circuit and open inspection
D506, D404, Q401 short-circuit inspection
IC608, IC607, IC402 inspection
T551 inspection
Exchange

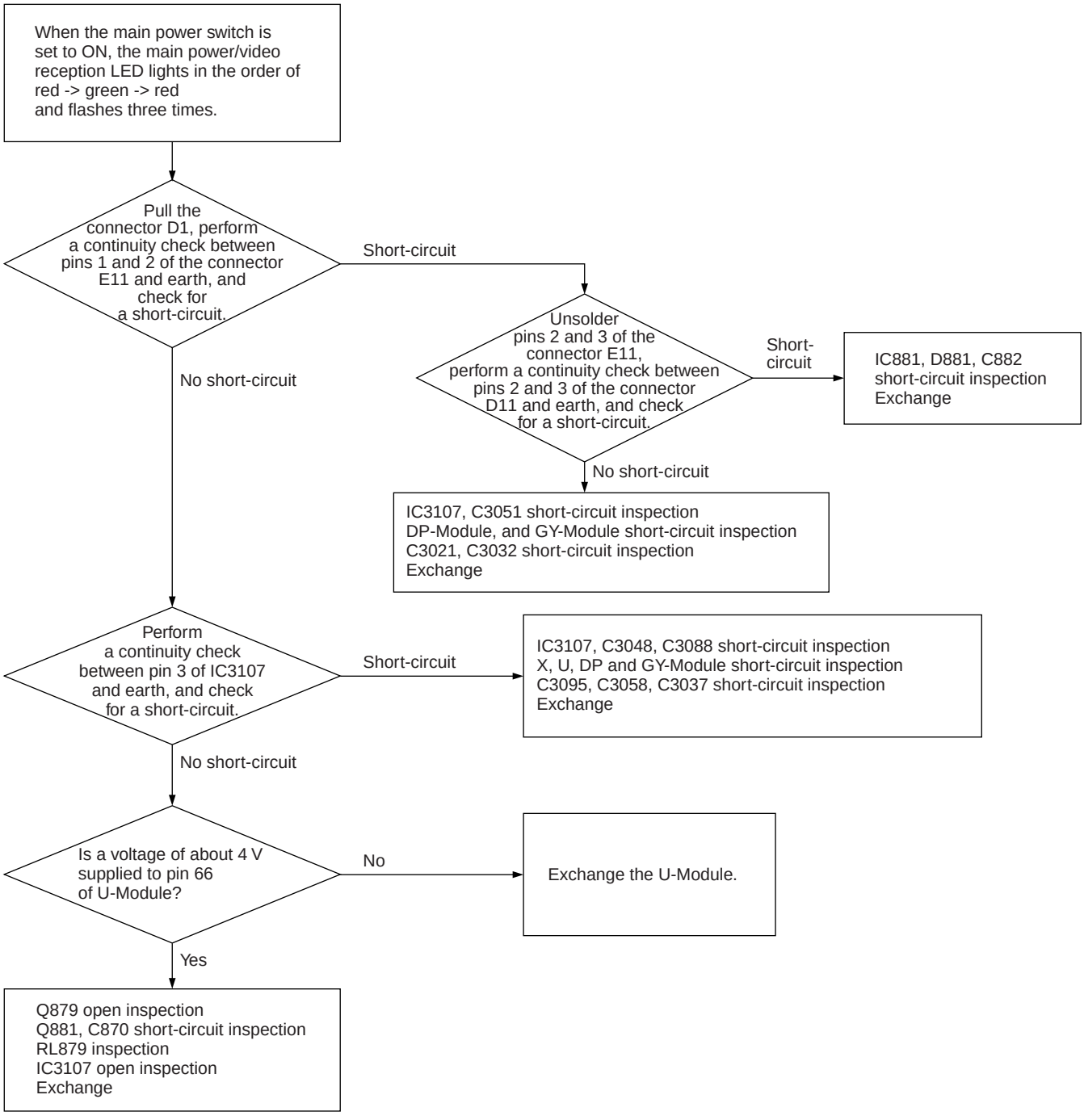
Main power/video reception LED flashes twice


When the main power switch is set to ON, the main power/video reception LED lights in the order of red -> green -> red and flashes twice.
IC881 open inspection
Q890 short-circuit inspection
Exchange

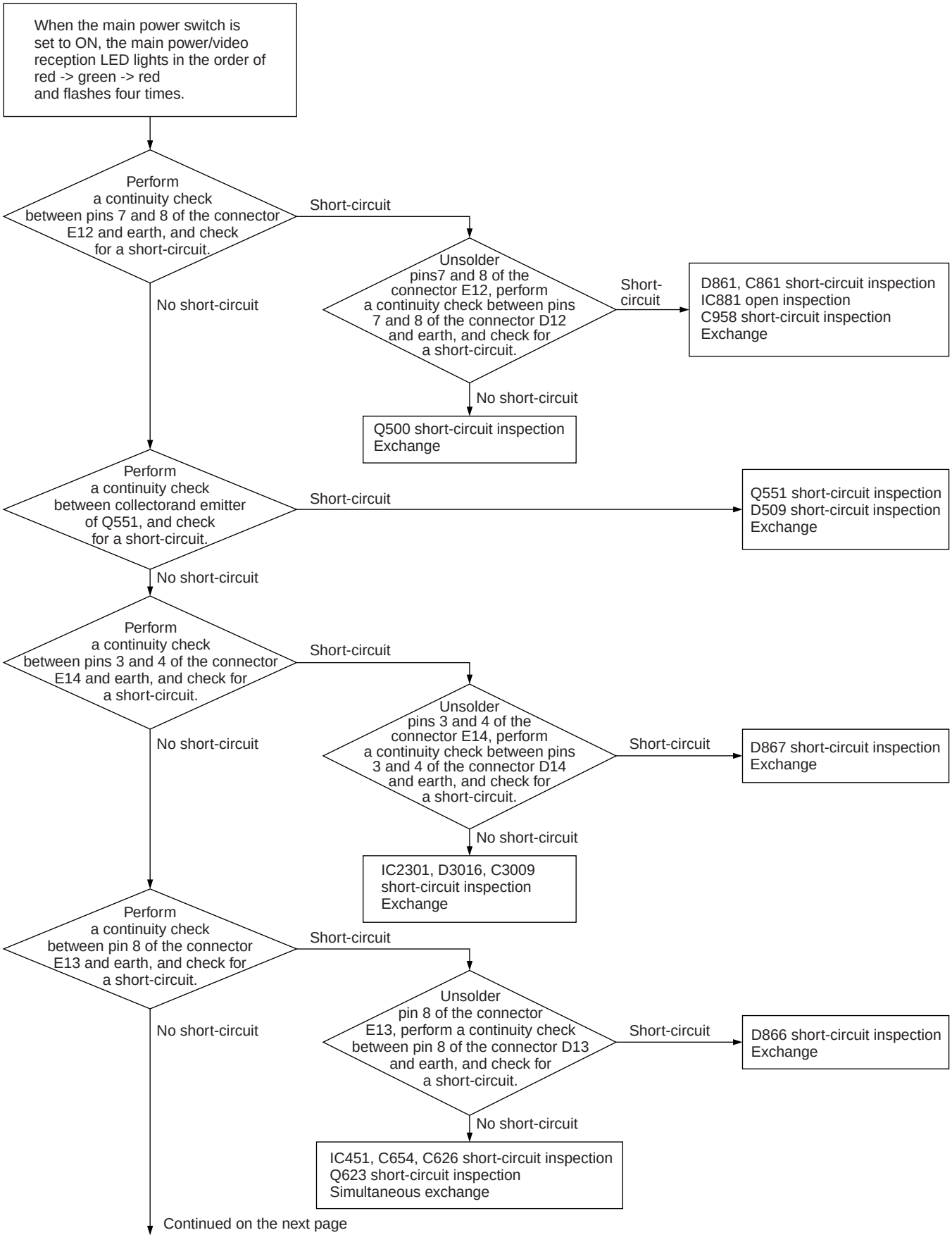
Main power/video reception LED flashes five times

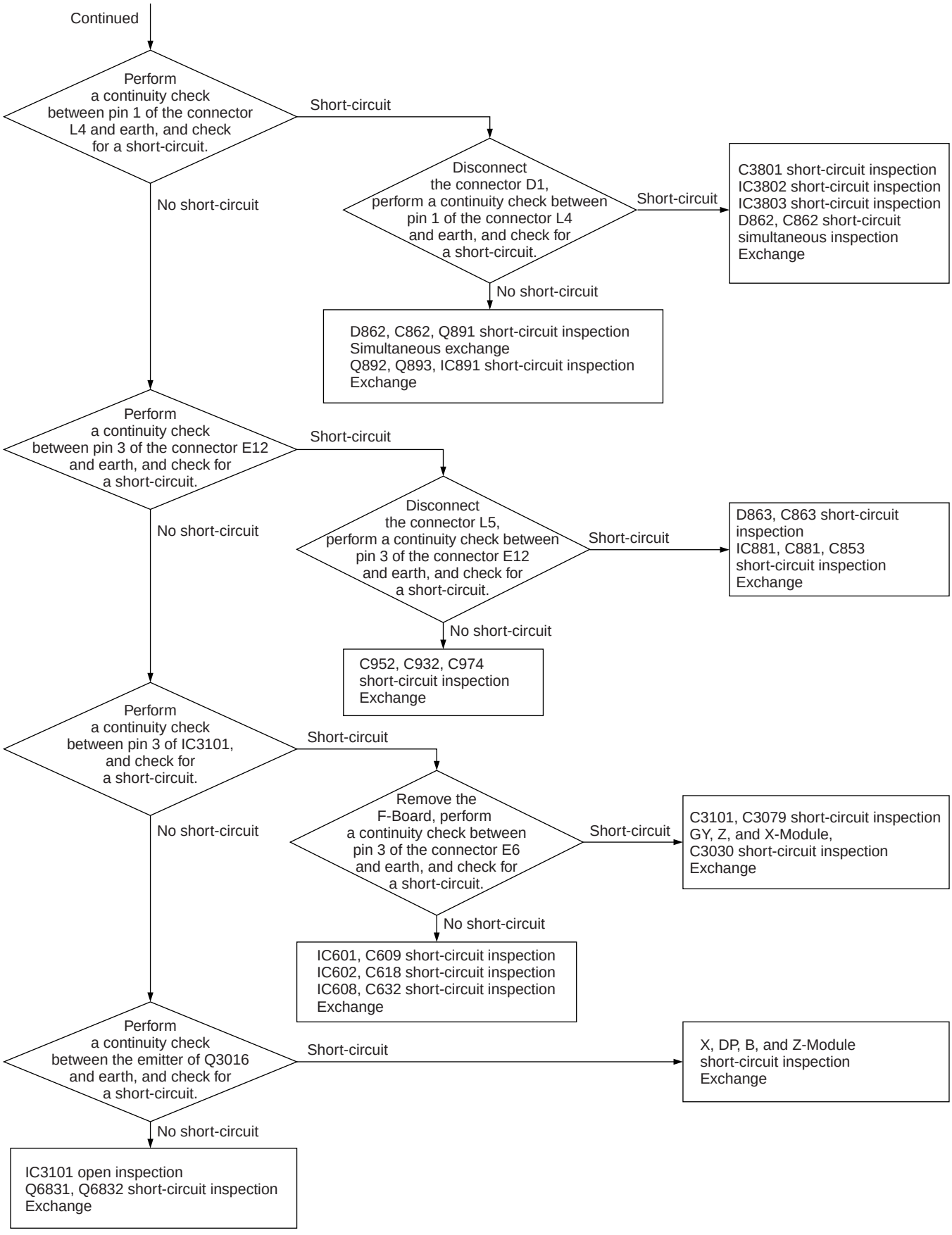

When the main power switch is set to ON, the main power/video reception LED lights in the order of red -> green -> red and flashes five times.
Perform a continuity check between pins 1 and 2 of the connector E13 and earth and check for a short-circuit.
Short-circuit
IC3109, C3117 short-circuit inspection
IC3110, C3069 short-circuit inspection
Exchange
* Flashing is done six times in case of a short-circuit on the rectification side.
No short-circuit
Perform a continuity check between pin 2 of IC3109 and earth and check for a short-circuit.
Short-circuit
IC3109, D3017 short-circuit inspection
IC3061, D3047, C3061 short-circuit inspection
J-Module and HM-Module short-circuit inspection Exchange
No short-circuit
IC3109 open inspection
IC3110 open inspection
Q3023 short-circuit inspection
D3039, D3050, D3022, D3035, D3011 short-circuit inspection
Exchange

Main power/video reception LED flashes three times

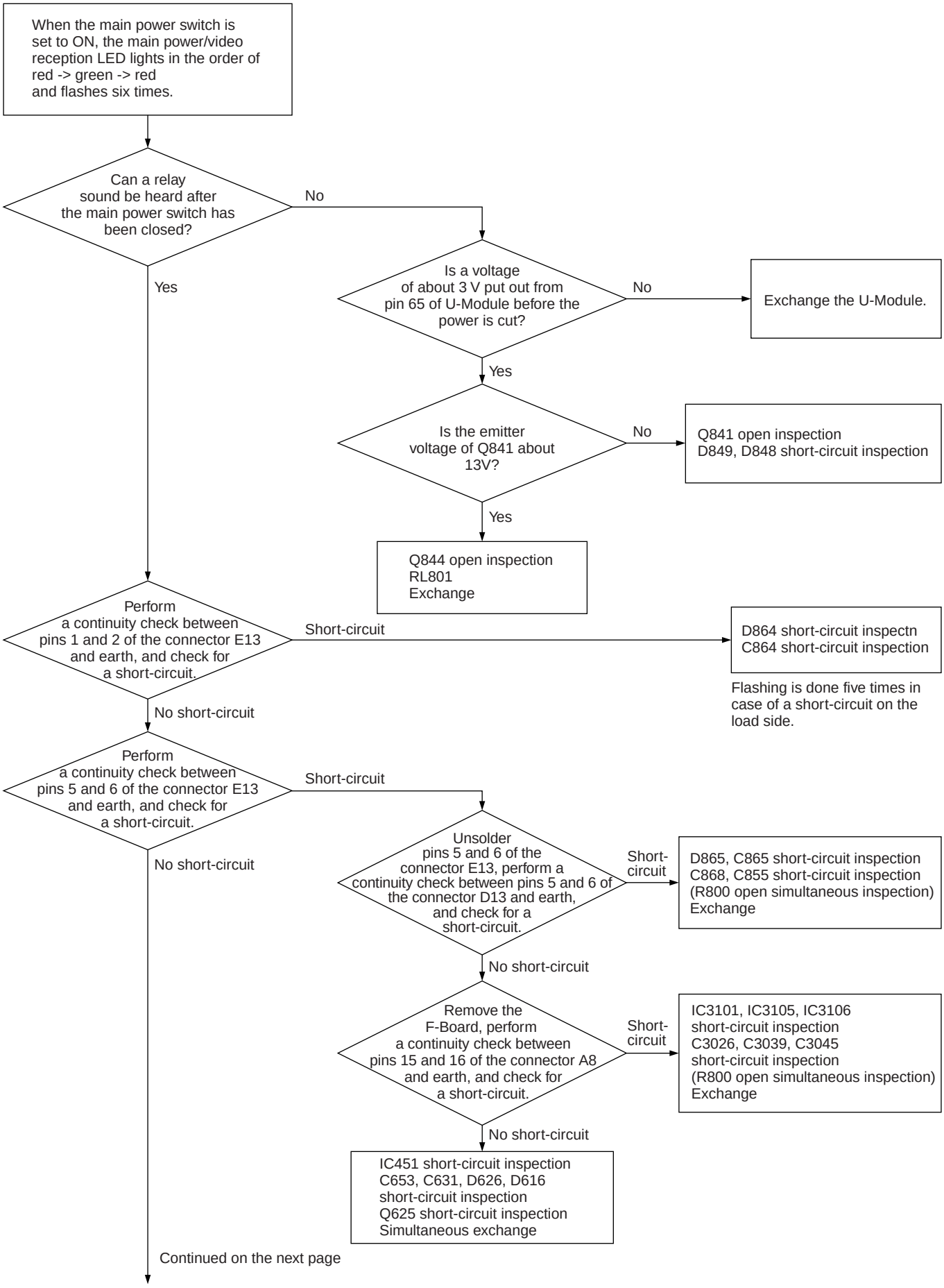

When the main power switch is set to ON, the main power/video reception LED lights in the order of red -> green -> red and flashes three times.
Pull the connector D1, perform a continuity check between pins 1 and 2 of the connector E11 and earth, and check for a short-circuit.
Short-circuit
Unsolder pins 2 and 3 of the connector E11, perform a continuity check between pins 2 and 3 of the connector D11 and earth, and check for a short-circuit.
Short-circuit
IC881, D881, C882 short-circuit inspection Exchange
No short-circuit
IC3107, C3051 short-circuit inspection DP-Module, and GY-Module short-circuit inspection C3021, C3032 short-circuit inspection Exchange
No short-circuit
Perform a continuity check between pin 3 of IC3107 and earth, and check for a short-circuit.
Short-circuit
IC3107, C3048, C3088 short-circuit inspection X, U, DP and GY-Module short-circuit inspection C3095, C3058, C3037 short-circuit inspection Exchange
No short-circuit
Is a voltage of about 4 V supplied to pin 66 of U-Module?
No
Exchange the U-Module.
Yes
Q879 open inspection Q881, C870 short-circuit inspection RL879 inspection IC3107 open inspection Exchange

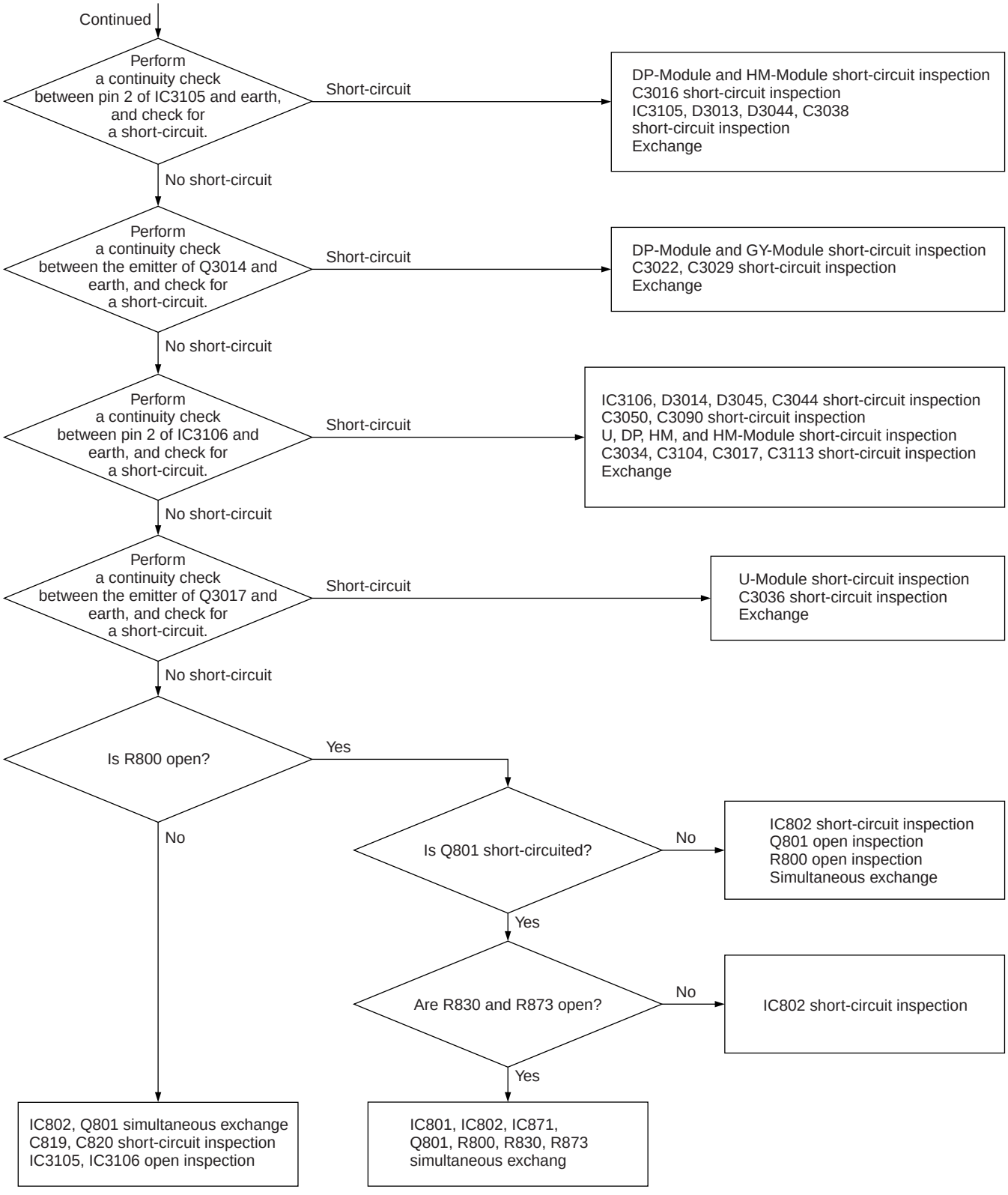
Main power/video reception LED flashes four times


When the main power switch is set to ON, the main power/video reception LED lights in the order of red -> green -> red and flashes four times.
Perform a continuity check between pins 7 and 8 of the connector E12 and earth, and check for a short-circuit.
Short-circuit
Unsolder pins7 and 8 of the connector E12, perform a continuity check between pins 7 and 8 of the connector D12 and earth, and check for a short-circuit.
Short-circuit
D861, C861 short-circuit inspection
IC881 open inspection
C958 short-circuit inspection
Exchange
No short-circuit
Q500 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between collectorand emitter of Q551, and check for a short-circuit.
Short-circuit
Q551 short-circuit inspection
D509 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between pins 3 and 4 of the connector E14 and earth, and check for a short-circuit.
Short-circuit
Unsolder pins 3 and 4 of the connector E14, perform a continuity check between pins 3 and 4 of the connector D14 and earth, and check for a short-circuit.
Short-circuit
D867 short-circuit inspection
Exchange
No short-circuit
IC2301, D3016, C3009 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between pin 8 of the connector E13 and earth, and check for a short-circuit.
Short-circuit
Unsolder pin 8 of the connector E13, perform a continuity check between pin 8 of the connector D13 and earth, and check for a short-circuit.
Short-circuit
D866 short-circuit inspection
Exchange
No short-circuit
IC451, C654, C626 short-circuit inspection
Q623 short-circuit inspection
Simultaneous exchange
No short-circuit
Continued on the next page


Continued
Perform a continuity check between pin 1 of the connector L4 and earth, and check for a short-circuit.
Short-circuit
Disconnect the connector D1, perform a continuity check between pin 1 of the connector L4 and earth, and check for a short-circuit.
Short-circuit
C3801 short-circuit inspection
IC3802 short-circuit inspection
IC3803 short-circuit inspection
D862, C862 short-circuit simultaneous inspection
Exchange
No short-circuit
D862, C862, Q891 short-circuit inspection
Simultaneous exchange
Q892, Q893, IC891 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between pin 3 of the connector E12 and earth, and check for a short-circuit.
Short-circuit
Disconnect the connector L5, perform a continuity check between pin 3 of the connector E12 and earth, and check for a short-circuit.
Short-circuit
D863, C863 short-circuit inspection
IC881, C881, C853 short-circuit inspection
Exchange
No short-circuit
C952, C932, C974 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between pin 3 of IC3101, and check for a short-circuit.
Short-circuit
Remove the F-Board, perform a continuity check between pin 3 of the connector E6 and earth, and check for a short-circuit.
Short-circuit
C3101, C3079 short-circuit inspection
GY, Z, and X-Module,
C3030 short-circuit inspection
Exchange
No short-circuit
IC601, C609 short-circuit inspection
IC602, C618 short-circuit inspection
IC608, C632 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between the emitter of Q3016 and earth, and check for a short-circuit.
Short-circuit
X, DP, B, and Z-Module short-circuit inspection
Exchange
No short-circuit
IC3101 open inspection
Q6831, Q6832 short-circuit inspection
Exchange

Main power/video reception LED flashes six times

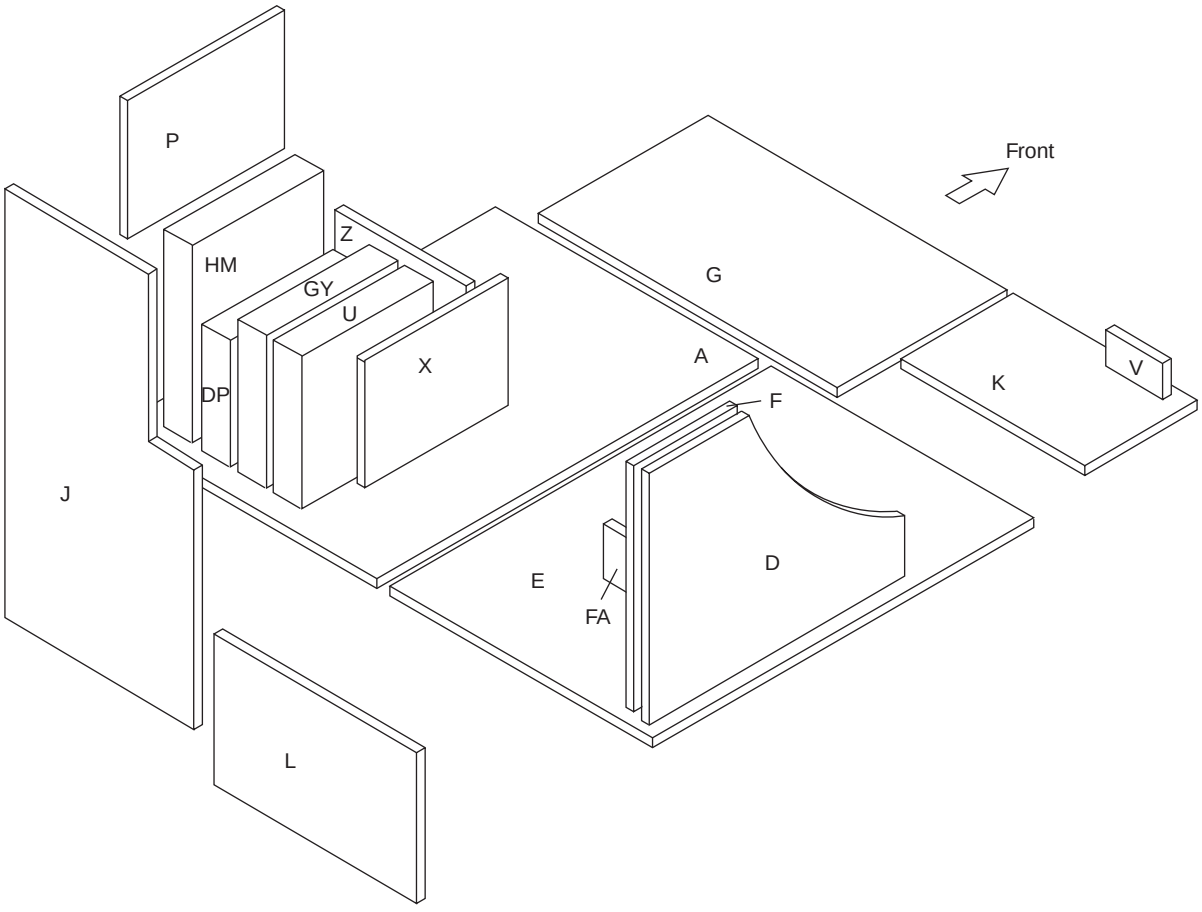

When the main power switch is set to ON, the main power/video reception LED lights in the order of red -> green -> red and flashes six times.
Can a relay sound be heard after the main power switch has been closed?
No
Yes
Is a voltage of about 3 V put out from pin 65 of U-Module before the power is cut?
No
Exchange the U-Module.
Yes
Is the emitter voltage of Q841 about 13V?
No
Q841 open inspection
D849, D848 short-circuit inspection
Yes
Q844 open inspection
RL801
Exchange
Perform a continuity check between pins 1 and 2 of the connector E13 and earth, and check for a short-circuit.
Short-circuit
D864 short-circuit inspectn
C864 short-circuit inspection
Flashing is done five times in case of a short-circuit on the load side.
No short-circuit
Perform a continuity check between pins 5 and 6 of the connector E13 and earth, and check for a short-circuit.
Short-circuit
Unsolder pins 5 and 6 of the connector E13, perform a continuity check between pins 5 and 6 of the connector D13 and earth, and check for a short-circuit.
Short-circuit
D865, C865 short-circuit inspection
C868, C855 short-circuit inspection
(R800 open simultaneous inspection)
Exchange
No short-circuit
Remove the F-Board, perform a continuity check between pins 15 and 16 of the connector A8 and earth, and check for a short-circuit.
Short-circuit
IC3101, IC3105, IC3106 short-circuit inspection
C3026, C3039, C3045 short-circuit inspection
(R800 open simultaneous inspection)
Exchange
No short-circuit
IC451 short-circuit inspection
C653, C631, D626, D616 short-circuit inspection
Q625 short-circuit inspection
Simultaneous exchange
No short-circuit
Continued on the next page


Continued
Perform a continuity check between pin 2 of IC3105 and earth, and check for a short-circuit.
Short-circuit
DP-Module and HM-Module short-circuit inspection
C3016 short-circuit inspection
IC3105, D3013, D3044, C3038 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between the emitter of Q3014 and earth, and check for a short-circuit.
Short-circuit
DP-Module and GY-Module short-circuit inspection
C3022, C3029 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between pin 2 of IC3106 and earth, and check for a short-circuit.
Short-circuit
IC3106, D3014, D3045, C3044 short-circuit inspection
C3050, C3090 short-circuit inspection
U, DP, HM, and HM-Module short-circuit inspection
C3034, C3104, C3017, C3113 short-circuit inspection
Exchange
No short-circuit
Perform a continuity check between the emitter of Q3017 and earth, and check for a short-circuit.
Short-circuit
U-Module short-circuit inspection
C3036 short-circuit inspection
Exchange
No short-circuit
Is R800 open?
Yes
No
Is Q801 short-circuited?
No
IC802 short-circuit inspection
Q801 open inspection
R800 open inspection
Simultaneous exchange
Yes
Are R830 and R873 open?
No
IC802 short-circuit inspection
Yes
IC802, Q801 simultaneous exchange
C819, C820 short-circuit inspection
IC3105, IC3106 open inspection
IC801, IC802, IC871, Q801, R800, R830, R873 simultaneous exchang

Main power/video reception LED flashes seven times

When the main power switch is set to ON, the main power/video reception LED lights in the order of red -> green -> red and flashes seven times.
C958 short-circuit inspection
Q831 short-circuit inspection
R831, R832 open inspection
T550, T551, T510
Exchange

Chassis Board Layout



Serviceable Boards

Board Number	Board Designation
TNPA1172AE	Z-Board, Surround
TNPA1186AD	F-Board, Deflection
TNPA1188AB	D-Board, Power
TNPA1200AB	L-Board, CRT/VM
TNPA1206AD	FA-Board, DAF
TNPA1489	P-Board, Line filter
TNPA1501	G-Board, AV Input terminal
TNPA1502	K-Board, Operation switches
TNPA1503	V-Board, LED indicator, Remote receiver
TNPH0236AF	A-Board, Main Video & Audio signals, EEPROM
TZTNP010EJR	E-Board, Deflection

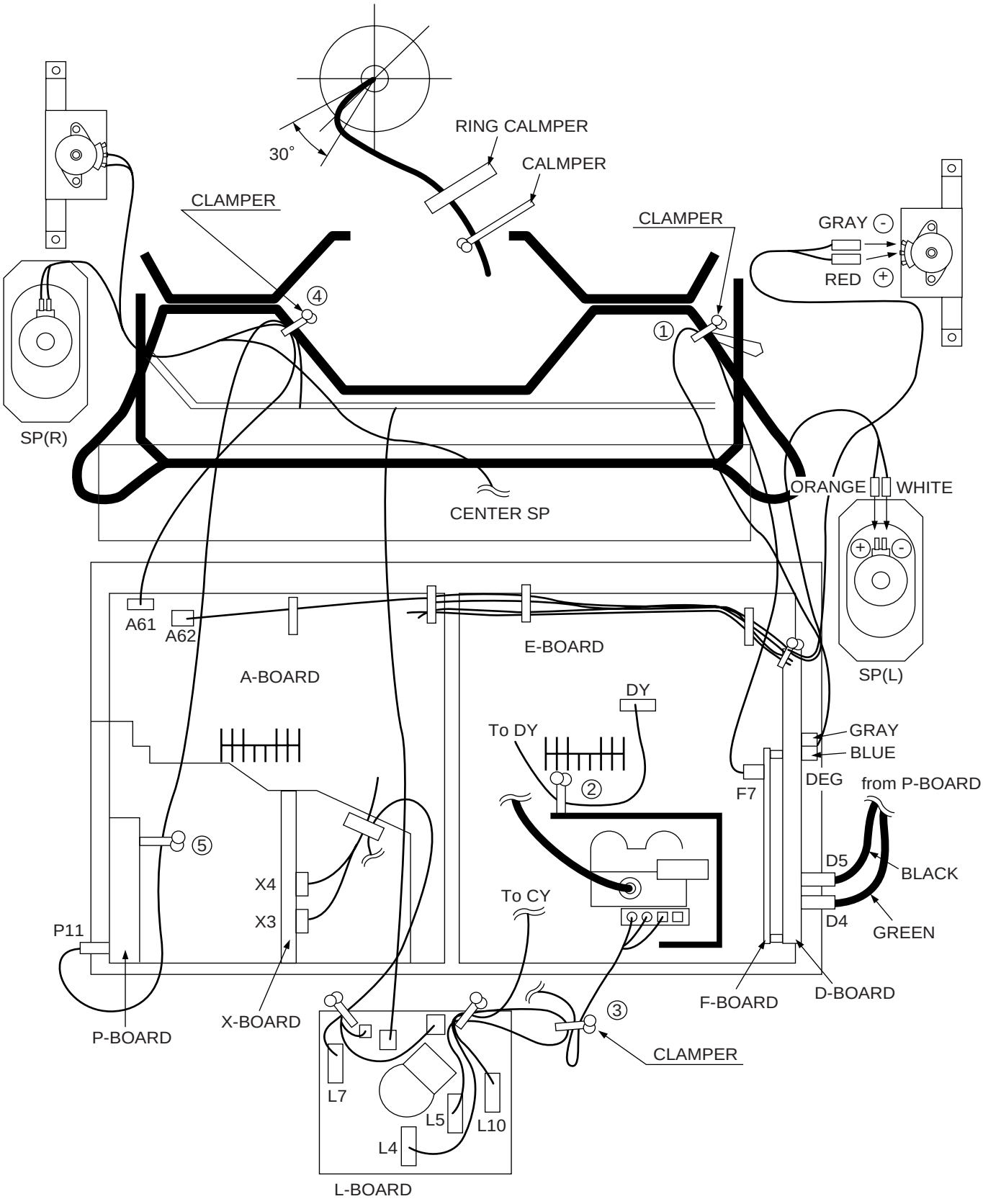
Non-Serviceable Boards

(See Note)

Board Number	Board Designation
TNAG044	HM-Module, Sync separator
TNAG045	U-Module, MPU, Flash memory
TNAG051	DP-Module, 1-P convertor
TNPA1189AD	J-Module, AV switching
TNPA1190AB	X-Module, RGB processor
TZTNA010EJR	GY-Module, 3D Y/C, NTSC Demodulator

Note: When a non-serviceable board is determined to be defective, please replace the board and return the defective board to the factory.

Location of Lead Wiring 1



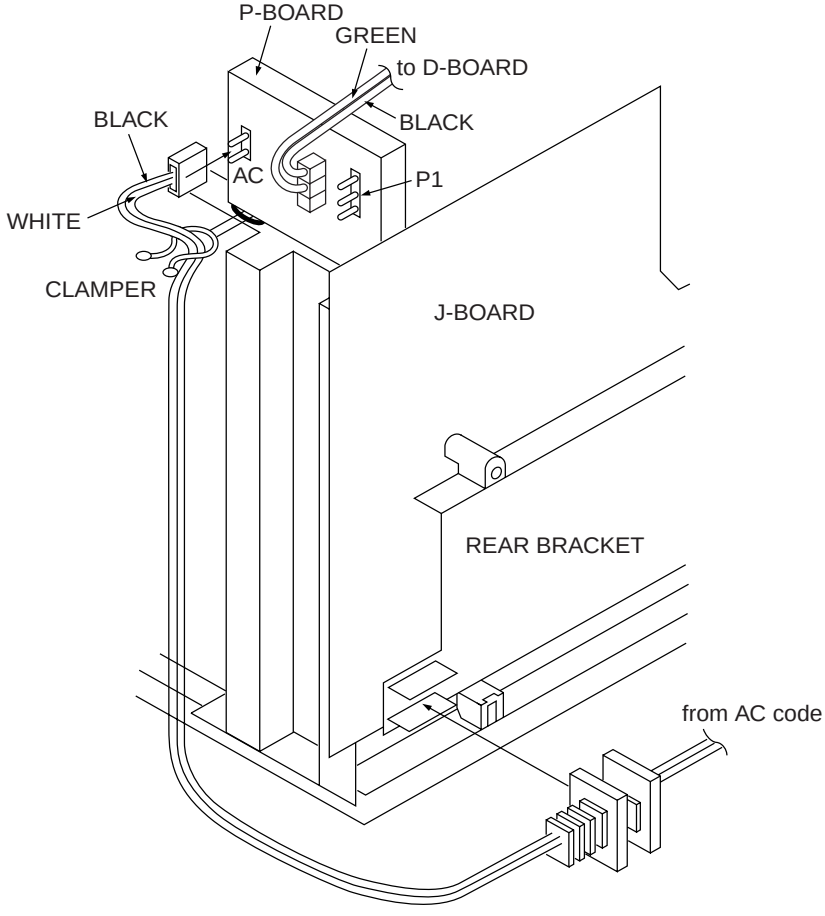
Location of Lead Wiring 2

CLAMPER / LEAD	①	②	③	④	⑤	○	○	○	○	○	○	○	○	○	○
DY		●													
F7	●														
Focus Screen			◎												
L4			●												
L5			●												
DEG	◎														
A61				●											
P11				●	●										

◎ : Wind up second times.

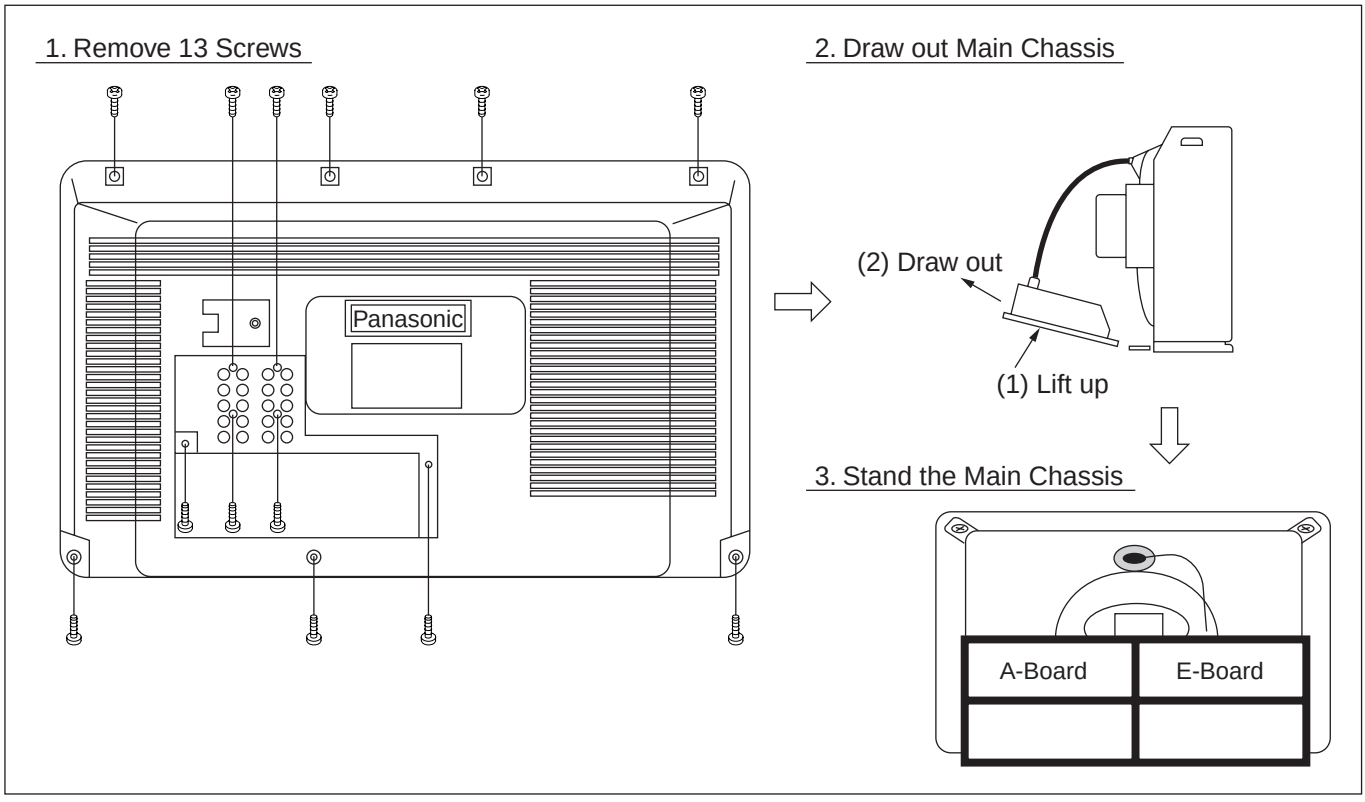
<CAUTION POINT>

1. The Lead Wires should separated at least 10mm from the FBT.
2. The Anode Leads should separated at least 10mm from the every parts.



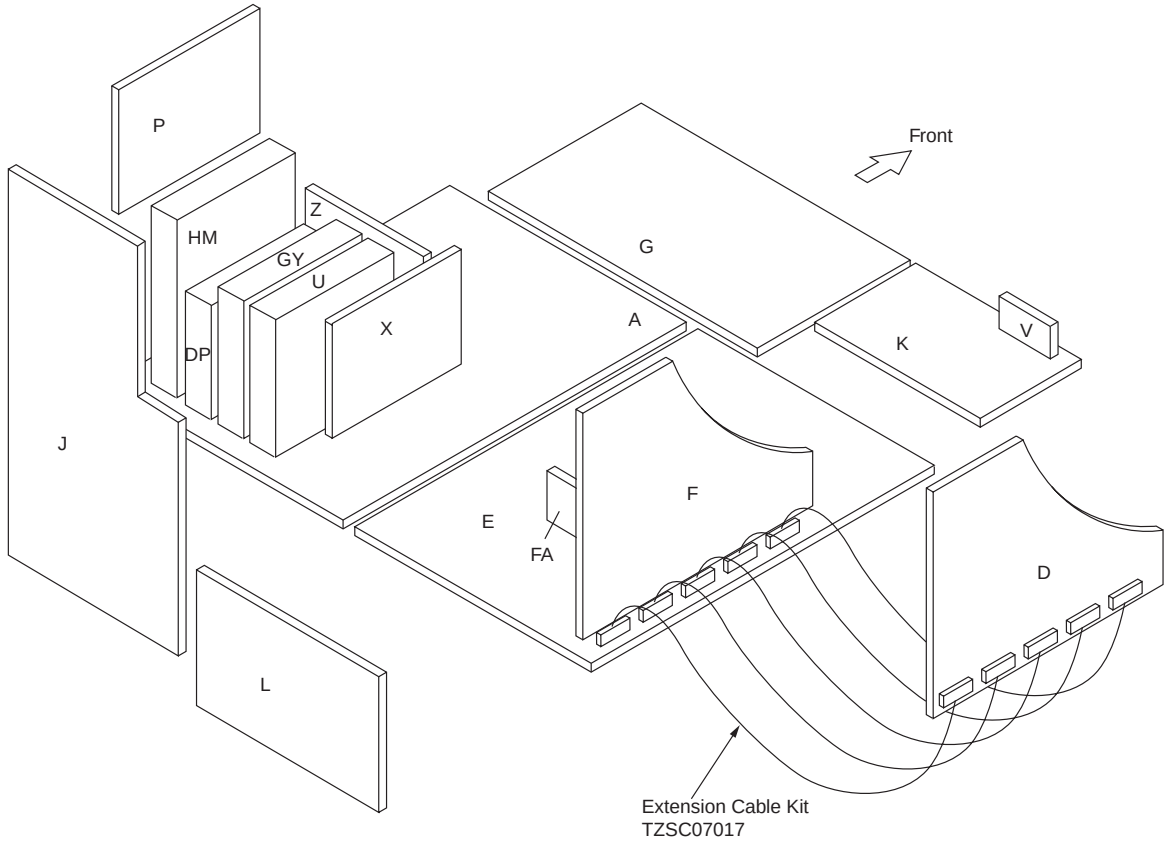
Service Hints

How to move chassis into service position



Service position for D, F and FA-boards

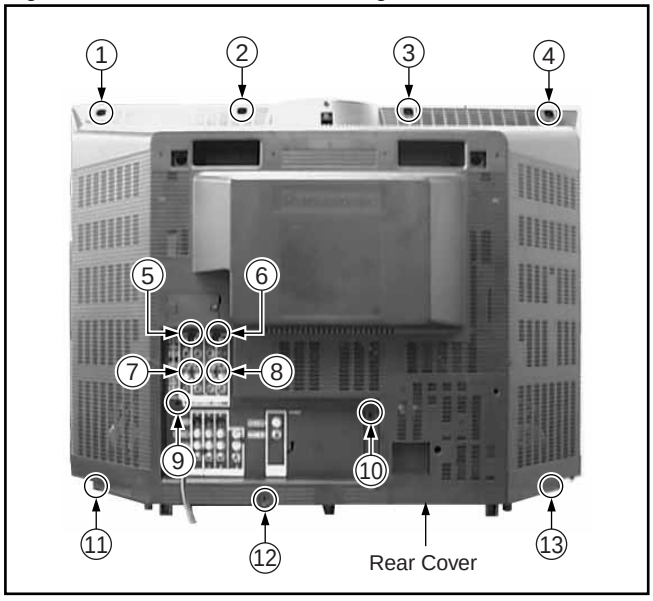
Note: Extension cable kit (6 pieces of 8 pin cables) is supplied as service fixtures and tools.
(Part No. TZSC07017)



Before servicing

(1) Remove the screws fixing the rear cover (13 pcs.: Refer to Fig. 1).

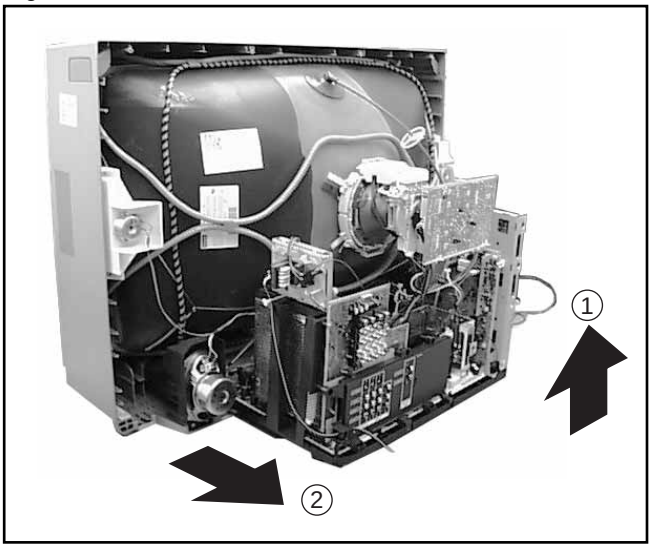
Fig.1 Positions of the screws fixing the rear cover



(2) Remove the rear cover by raising the chassis a little ① and pulling to the rear ②. (Refer to Fig. 2.)

* At this time, disconnect the coupler P11, the ring clamper, etc. as required to facilitate the pulling out of the chassis.

Fig.2 How to tilt the chassis



* After completion of servicing, any disconnected couplers and clampers must be restored to their original condition.

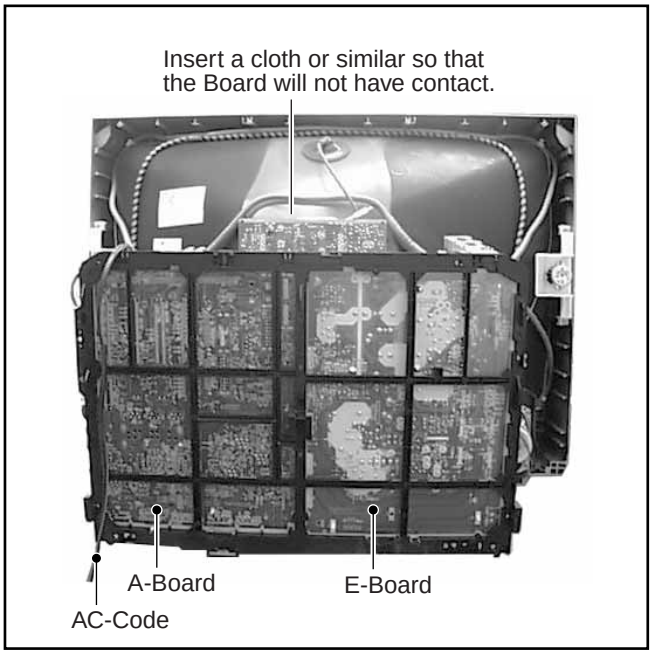
In regard to inspection of A-Board and E-Board

- The A-Board and E-Board can be inspected from the pattern side when the chassis is pulled out and tilted up. (Refer to Fig. 3.)

* At this time, disconnect the coupler P11, the clamp, etc. as required to facilitate tilting of the chassis.

* When tilting the chassis, pay sufficient attention to the L-Board at the neck of the picture tube

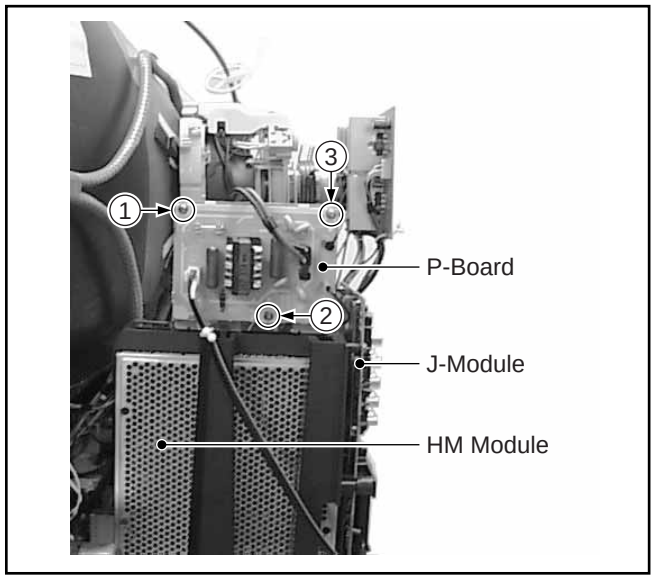
Fig.3 Inspection of the A-Board and E-Board



Inspection of the P-Board

- When the screws (3 screws: Refer to Fig. 4) fixing the P-Board are removed and the P-Board is removed from its fixing fitting, inspection from the pattern side becomes possible.

Fig.4 Inspection of the P-Board



Inspection of the D-Board

- As the D-Board can not be inspected from the pattern side, refer to the pattern side/parts side of the circuit diagram (Page 66, 67), and perform the inspection by bringing the tester into contact with the jumper wires and parts.

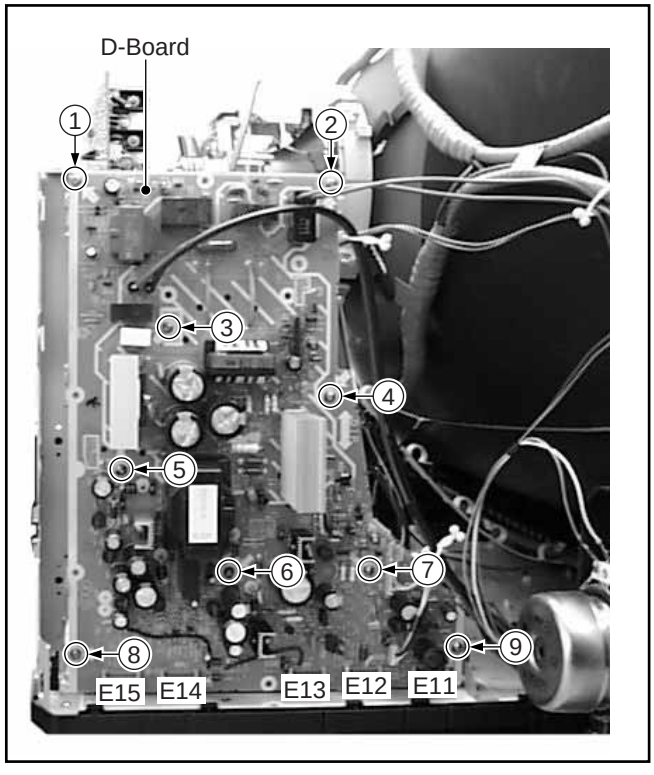
Parts exchange for the D-Board

(1) When parts are to be exchanged, first remove the screws (9 screws: Refer to Fig. 5) fixing the printed circuit board [D].

(2) Next, remove the D-Board from the E-Board (5 connectors: E11 to E15: Refer to Fig. 5), and then exchange the parts.

* Pay attention to the earthing of HOT and COLD parts and perform inspection.

Fig.5 Inspection of the D-Board



Inspection of the F-Board and FA-Board

- As inspection of the printed F-Board and FA-Board from the pattern side is not possible, refer to the pattern side/parts side of the circuit diagram (Page 72, 73), and perform the inspection by bringing the tester into contact with the jumper wires and parts.

Point

(1) Use the fact that all lead wires have some slack, pull out the chassis to the front, turn the left side of the chassis with the right side of the chassis as the axis in horizontal direction to secure the measuring points.

* Pay attention to the flyback transformer and perform inspection.

Parts exchange F-Board

(1) When parts are to be exchanged, first remove the fixing fittings of the D-Board and F-Board.

* When removing the fixing fittings of the D-Board and F-Board, also remove the setscrews (2 screws) of the fixing fittings, the fixings claws (2 places of the F-Board, and the earth wires from the heat sink of the flyback transformer to the fixing fittings of the D-Board and F-Board at the same time.

Do not forget!

* After completion of servicing, the earth wires from the heat sink of the flyback transformer to the fixing fittings of the D-Board and F-Board must be fixed again with screws in their original condition.

Fig.6 Inspection of the F-Board-1

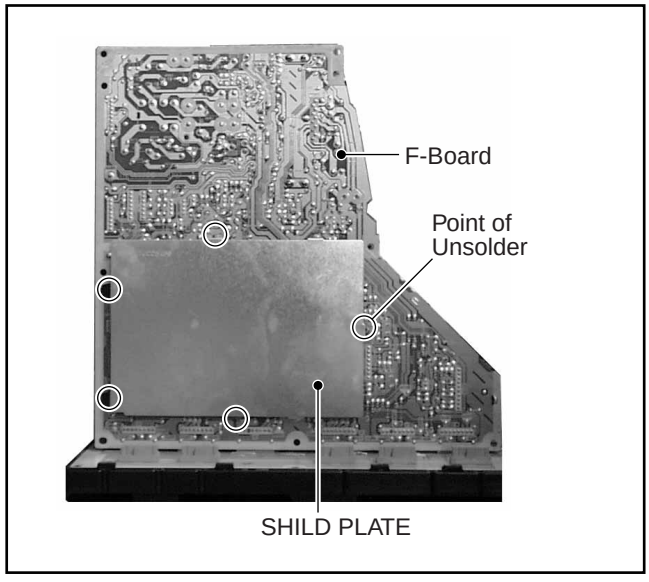
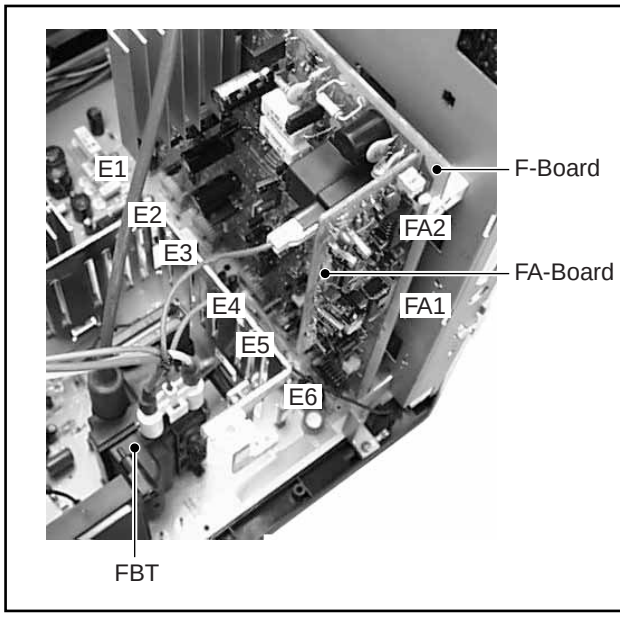


Fig.7 Inspection of the F-Board



(2) Next, suck off the solder from the shield plate of the F-Board (6 places: Refer to Fig. 6).

* Remove the shield plate as required.

(3) Finally, remove the F-Board from the E-Board (6 connectors: E1 to E6 -> Refer to Fig. 7), and then exchange the parts.

Parts exchange for the FA-Board

- For parts exchange, first remove the FA-Board from the F-Board (2 couplers: FA1/FA2 -> Refer to Fig. 7), and then exchange the parts.

Finally:

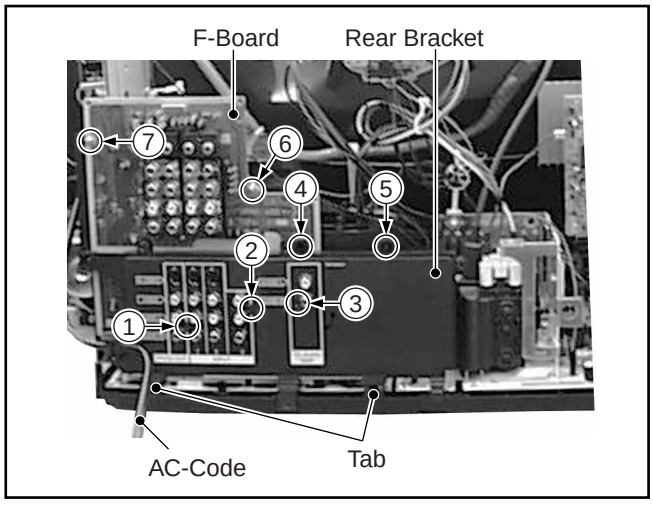
* After exchange of the parts of the F-Board, confirm the image, and if adjustment is required, refer to pages 33 to 45.

Exchange method for the rear terminal, input switching J-Module

(1) Remove the read panel fixing screws (5 screws: ① to ⑤) and the fixing tabs (2 places). (Refer to Fig. 8.)

(2) Remove the screws (2 screws: ⑥/⑦) fixing the J-Module, tilt the J-Module to the front and pull it out, and then exchange the J-Module.

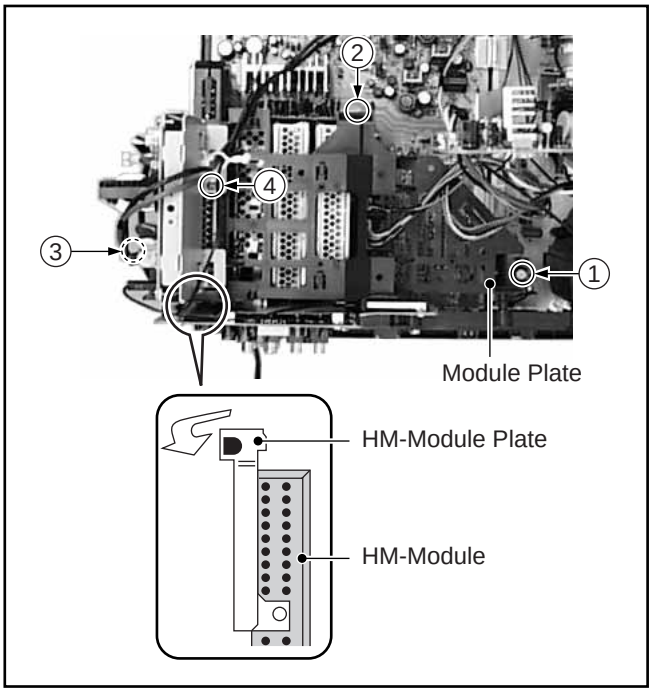
Fig.8 Module exchange



Exchange method for HM-Module, DP-Module, GY-Module, and X-Module

* Remove the J-Module in advance. (Refer to the preceding item.)

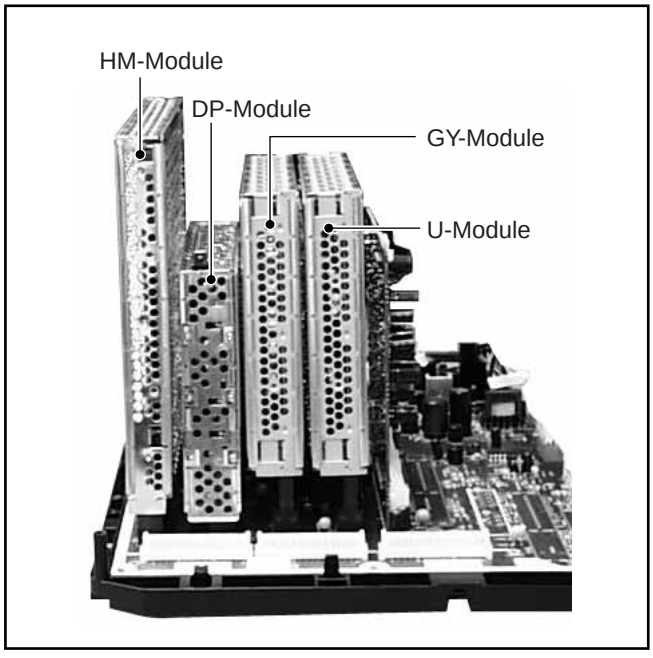
Fig.9 Exchange of each module - 1 (seen from above)



(1) Remove the setscrews (3 screws: ① to ③) of the module fixing fittings and the couplers X3 and X4. (Refer to Fig. 9.)

(2) Remove the setscrew (1 screw: ④) of the fixing fitting of the P-Board, and pull the fixing fitting of the HM-Module to the front to remove the module fixing fitting. (Refer to Fig. 9.)

Fig.10 Exchange of each module - 2 (view from the rear)



(3) After removal of the module fixing fitting, pull out each module and exchange it. (Refer to Fig. 10.)

* When GY-Module has been exchanged, refer to pages 29 and 30 and perform the respective adjustments.

Service Adjustment Mode

Exchange parts and required adjustment

As shown in the following table, adjustment will be required when some parts have been exchanged.

ADJUSTMENT CONTENTS · ITEMS \ EXCHANGE PARTS			MEMORY (IC3071)	X MODULE	DEF. YOKE	F.B.T.	IC402 (F-Board)	HM MODULE	DP MODULE	GY MODULE
W.B. ADJ.	HYBRID GAMMA (CUT-OFF) (WHITE BALANCE)	SUB BRIGHT	△	×	×	○	×	×	×	×
		RGB CUT-OFF	△	×	×	○	×	×	×	×
		RGB CUT-OFF	△	×	×	○	×	×	×	×
		RGB DRIVE	△	○	△	○	×	×	×	×
DEF. ADJ.	DEF. ADJ.	H-POSITION	○	×	○	△	○	×	×	×
		H-SIZE	○	×	○	△	○	×	×	×
		SIDE-PCC	○	×	○	△	○	×	×	×
		H-PARALLEL	○	×	○	△	○	×	×	×
		H-LINEARITY	△	×	○	△	○	×	×	×
		V-POSITION	○	×	○	△	○	×	×	×
		TRAPAZOID	○	×	○	△	○	×	×	×
		V-LINEARITY	○	×	○	△	○	×	×	×
		V-SIZE	○	×	○	△	○	×	×	×
		PCC	○	×	○	△	○	×	×	×
		EW-CORNER·TOP	○	×	○	△	○	×	×	×
		EW-CORNER·BOTTOM	○	×	○	△	○	×	×	×
		V-S CORRECTION	○	×	○	△	○	×	×	×
		MOIRE	○	×	○	△	○	×	×	×
NTSC ADJ.	NTSC DECODER	Y-DRIVE	×	×	×	×	×	×	×	□
		B-Y / R-Y	×	×	×	×	×	×	×	□
		SUB TINT	×	×	×	×	×	×	×	□
FOCUS ADJ.			×	×	×	○	×	×	×	×

* "○" indicates that adjustment always is required.
* "△" indicates that adjustment is to be performed as required.
* "□" indicates that reference should be made to the enclosed data sheet and that the adjustment value(s) shown on the data sheet should be entered. After confirmation of the screen, fine adjustment should be performed as required.
* "x" indicates that adjustment is not required.
* Refer to pages 31 and 32 for "white balance adjustment".
* Refer to pages 33 to 45 for "adjustment of the deflection system".

Entry into service adjustment mode

Hold the "VOL -" button inside the door of the operation section of this unit pressed and press the "RECALL" button on the remote control three times in a row (within 2 sec.). (Refer to Fig. 1.)

Fig.1 Entry into service adjustment mode

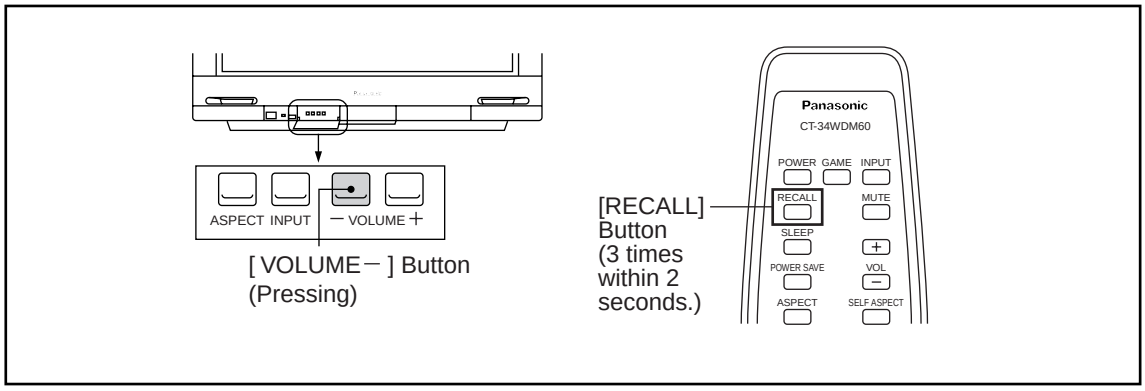
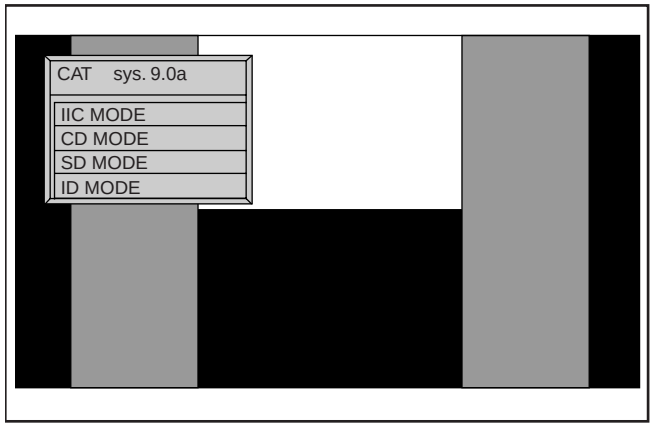


Fig.2 Initial screen for service adjustment mode



- The service adjustment mode has four modes, and only the "IIC mode" can be opened. (Refer to Fig. 2.)

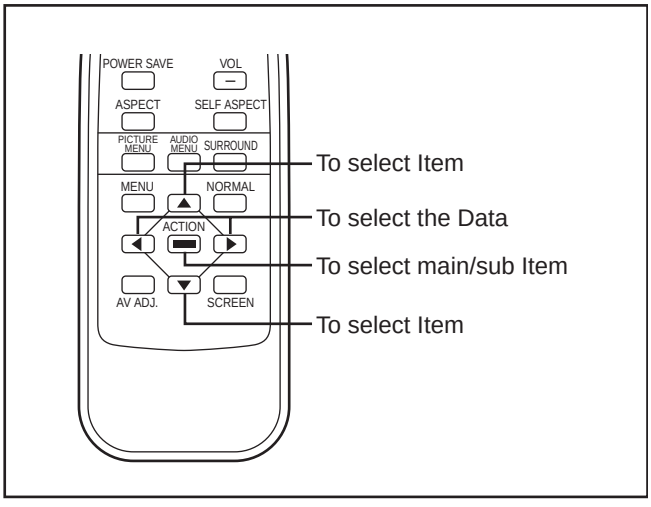
(1) IIC mode> Select this mode for performing the various adjustments.

Cancellation
Switch off the power or press POWER on the remote control.

At the time of service adjustment
As the values entered in service adjustment mode differ according to the set, perform adjustment operation in service adjustment mode after the values for each item have been prepared.

1. IIC Mode

Fig.3 Remote control



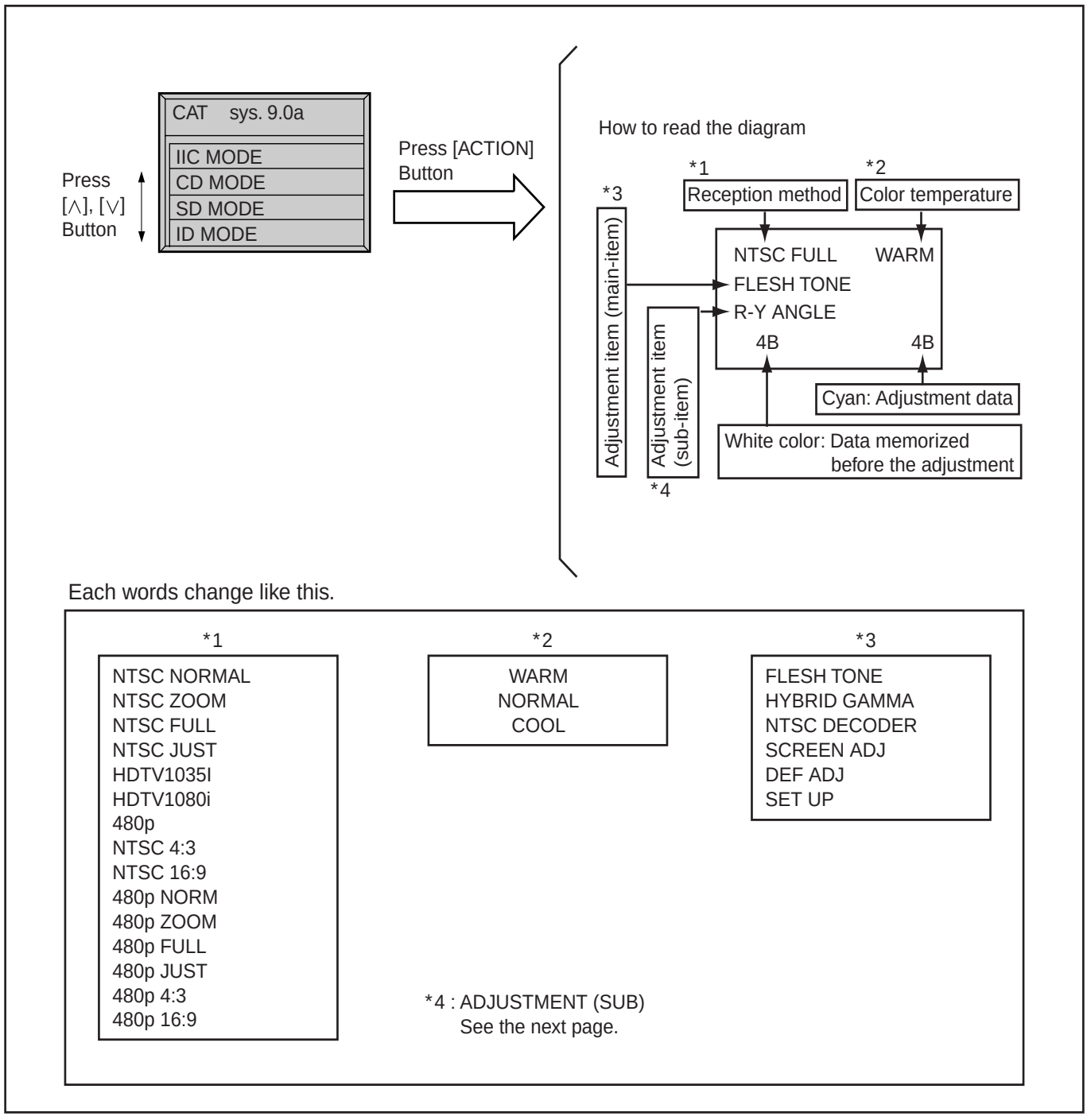
Adjustment method... Use the remote control (refer to Fig. 3)

- Select "IIC mode" with the cursor keys [▲] and [▼] of the remote control, and press the "ACTION" key to display the adjustment screen.

▲ (1)Button: Selection of main items in forward direction
▼ (2)Button: Selection of main items in reverse direction
▲ (3)Button: Selection of sub-items in forward direction
▼ (4)Button: Selection of sub-items in reverse direction
(5)Button: One horizontal line at the time of hybrid gamma adjustment
(6)Button: Single-color screen at the time of hybrid gamma adjustment Only R, G, B, Cut-off
(8)Button: Built-in cross-hatch pattern
"ACTION" Button: switch main items and sub-items

* ◀ ▶(volume +, -) buttons: For adjustment
* Press the NORMAL button for 3 seconds
1.Copy function: (Only hybrid gamma, G cut-off) -> Refer to page 31.
2.Offset function: Only distortion correction -> Refer to page 33.
( ).....In case of uses the 10 Digit key Remocon

How to Read the Serve Adjustment Mode



CAT (Computer Aided Test) mode

Mode	Function	Access button
IIC	Service Alignment	ACTION
CD (Complete Diagnostics)	Software version information EEP ROM edit	MUTE (3 sec.)
SD (Status Display)	Factory use	
ID (Initial Data)	Not use	

IIC Mode Function

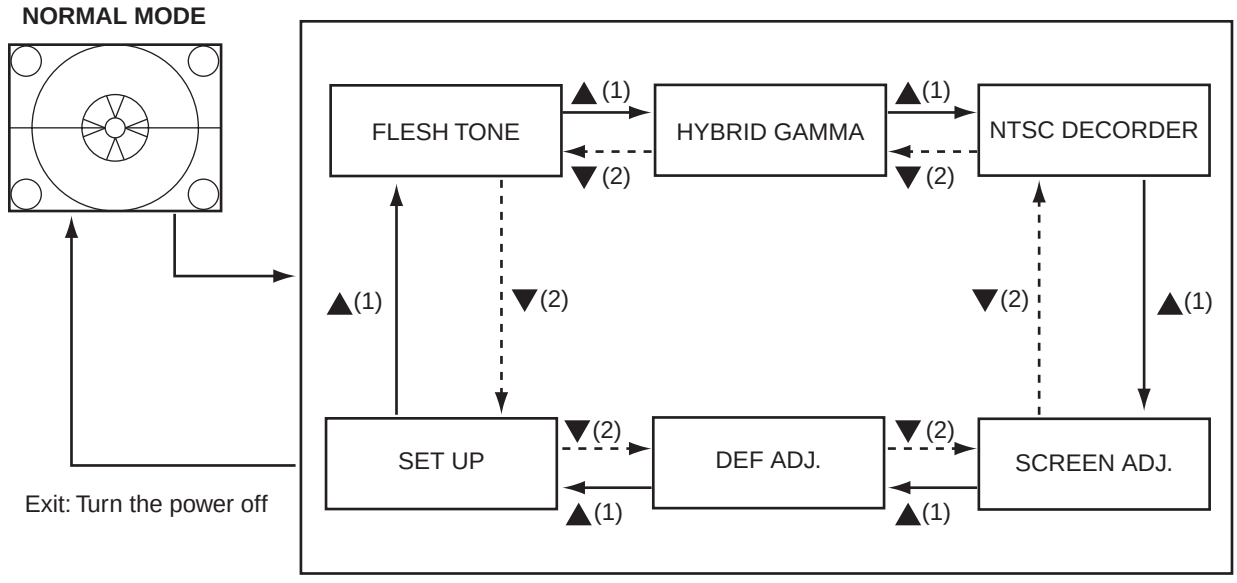
Outline: MPU controls the functions switching for each ICs through IIC bus in this chassis. The following setting and adjustment can be adjusted by remote control in IIC Mode.

1.Selection of IIC Mode

Press and hold Volume down [-] key on the front panel of the unit and press RECALL[(+)] Button on the remote control 3 times quickly within 2 seconds.

2. List of the main items of IIC mode: The IIC mode has six main items, and button ▲ (1) of the remote control can be used to go through the main items in forward direction, while button ▼ (2) can be used to go through the main items in reverse direction.
( ).....10key REMOCON

How to read the diagram



1.FLESH TONE

To change the screen (item) in IIC mode, press "▲(3)" or "▼(4)" of 10 key button. Then Date and Level changes by pressing "◀(Volume +)" or "▶(Volume -)" button.

( ).....10key Remocon

No.	Display	Average Data
1	R-Y ANGLE	5
2	R-Y AXIS GAIN	16
3	SUB TINT	47
4	SUB COLOR	46

Note: This adjustment is NTSC FULL mode and HDTV1080i mode only. (Refer to page 29)

2.HYBRID GAMMA

To change the screen (item) in IIC mode, press "▲(3)" or "▼(4)" of 10 key button. Then Data can be changed by pressing "◀(Volume +)" or" ▶(Volume +)" button.
( ).....10 key Remocon

No.	Display	Average Data
1	REAL CONTRAST	4C
2	REAL BRIGHT	98
3	R DRIVE	70
4	B DRIVE	83
5	G DRIVE	21
6	R CUT OFF	23D
7	B CUT OFF	23C
8	G CUT OFF	96
9	SUB CONTRAST	4F
10	SUB BRIGHT	92
11	BLOOMING DC	73

Note: This adjustment is NTSC FULL mode and HDTV1080i mode only. (Refer to page 29)

3.NTSC DECORDER

To change the screen (item) in IIC mode, press "▲(3)" or "▼(4)"10 key button, Then Data can be changed by pressing "◀(Volume +)" or" ▶(Volume +)" button.
( ).....10 key Remocon

No.	Display	Average Data
1	Y-DRIVE	18
2	B-Y/R-Y	1D
3	SUB TINT	19

Note: This adjustment is NTSC FULL mode and HDTV1080i mode only. (Refer to page 29)

4.SCREEN ADJUSTMENT

To change the screen (item) in IIC mode, press "▲(3)" or "▼(4)" of 10 key button, Then Data can be changed by pressing "◀(Volume +)" or" ▶(Volume +)" button.
( ).....10 key Remocon

No.	Display	Average Data
1	V-POSITION	86
2	V-SIZE	51
3	H-POSITION	13
4	H-SIZE	1F
5	BLANKING START	B2
6	BLANKING END	38
7	DAF SYNC	6D

5.DEFECTION ADJUSTMENT

To change the screen (item) in IIC mode, press "▲(3)" or "▼(4)" of 10 key button, Then Data can be changed by pressing "◀(Volume +)" or" ▶(Volume +)" button.

( ).....10 key Remocon

No.	Display	Average Data
1	H-POSITION	13
2	H-SIZE	1F
3	SIDE-PCC	8
4	H-PARALLEL	8
5	H-LINEARTY	98
6	V-POSITION	86
7	TRAPEZOID	22
8	V-LINEARITY	1B
9	V-SIZE	51
10	PCC	10
11	EW-CORNER TOP	4
12	EW-CORNER BOTTOM	4
13	V-S CORRECTION	15
14	MOIRE	0

6.SET UP

To change the screen (item) in IIC mode, press "▲(3)" or "▼(4)" of 10 key button, Then Data can be changed by pressing "◀(Volume +)" or" ▶(Volume +)" button.

( ).....10 key Remocon

No.	Display	Average Data
1	X-RAY ADJ.	4F
2	EHT ADJ.	4F
3	CRT AGING	0

Note: This adjustment is NTSC FULL mode only. (Refer to page 29)

Table of the service adjustment items which can or can not be adjusted in each mode

Main-Item	Sub-Item	NTSC				HDTV1080i	480p	
		NORMAL	ZOOM	FULL	JUST		SDTV COLOR MATRIX	HDTV COLOR MATRIX
FLESH TONE	R-Y ANGLE	×	×	○	×	○	×	×
	B-Y AXIS GAIN	×	×	○	×	○	×	×
	SUB TINT	×	×	○	×	○	×	×
	SUB COLOR	×	×	○	×	○	×	×
HYBRID GAMMA	REAL CONTRAST	×	×	○	×	○	×	×
	REAL BRIGHT	×	×	○	×	○	×	×
	R DRIVE	×	×	○	×	○	×	×
	B DRIVE	×	×	○	×	○	×	×
	G DRIVE	×	×	○	×	○	×	×
	R CUT-OFF	×	×	○	×	○	×	×
	B CUT-OFF	×	×	○	×	○	×	×
	G CUT-OFF	×	×	○	×	○	×	×
	SUB CONTRAST	×	×	○	×	○	×	
	SUB BRIGHT	×	×	○	×	○	×	
	BLOOMING DC	×	×	○	×	○	×	
NTSC DECODER	Y DRIVE	×	×	○	×	×	×	
	B-Y / R-Y	×	×	○	×	×	×	
	SUB TINT	×	×	○	×	×	×	
SCREEN ADJ.	V-POSITION	○	○	○	○	○	○	
	V-SIZE	○	○	○	○	○	○	
	H-POSITION	○	○	○	○	○	○	
	H-SIZE	○	○	○	○	○	○	
	BLANKING START	×	×	×	×	×	×	
	BLANKING END	×	×	×	×	×	×	
	DAF SYNC	×	×	○	×	○	×	
DEF. ADJ.	H-POSITION	○	○	○	○	○	○	
	H-SIZE	○	○	○	○	○	○	
	SIDE-PCC	○	○	○	○	○	○	
	H-PARALLEL	○	○	○	○	○	○	
	H-LINEARITY	×	×	○	×	×	×	
	V-POSITION	○	○	○	○	○	○	
	TRAPEZOID	○	○	○	○	○	○	
	V-LINEARITY	○	○	○	○	○	○	
	V-SIZE	○	○	○	○	○	○	
	PCC	○	○	○	○	○	○	
	EW-CORNER·TOP	○	○	○	○	○	○	
	EW-CORNER·BOTTOM	○	○	○	○	○	○	
	V-S CORRECTION	○	○	○	○	○	○	
	MOIRE	×	×	○	×	×	×	
SET UP	X-RAY ADJ.	×	×	○	×	×	×	
	EHT ADJ.	×	×	○	×	×	×	
	CRT AGING	×	×	○	×	×	×	

** "○" means that adjustment is possible.
** "x" means that adjustment is not possible.
("SET UP" - "CRT AGING" can not be adjusted.)

Caution items at the time of module exchange

When the NTSC decoder module [GY] is exchanged, reference must be made to the included data sheet and the adjustment values must be entered.

Adjustment Value Input Procedure

(1) Enter into service adjustment mode and select IIC mode. (Refer to page 24 for how to enter into service adjustment mode.)
(2) Select the adjustment item with the remote control and enter the adjustment value. (Refer to pages 26 to 28 for the list of adjustment items.)
(3) After input of the adjustment values has been completed, switch off the power with the remote control (or at the main unit) to cancel the adjustment mode. Input an NTSC signal or a 1080i signal and confirm the image.

When the NTSC decoder module [GY] has been exchanged

Before adjustment:

*Input an NTSC signal on one screen and set the aspect ratio to "FULL".
*Select "NTSC decoder" in "IIC mode" and perform adjustment.

Example: Included data sheet

Adjustment item	Adjustment value		Data value
Y DRIVE	Upper bit Lower bit	0 ① 2 3 4 5 6 7 8 9 A B C D E F 0 1 2 3 4 5 6 7 8 ⑨ A B C D E F	19
SUB TINT	Upper bit Lower bit	0 ① 2 3 4 5 6 7 8 9 A B C D E F 0 1 2 3 4 5 6 7 8 ⑨ A B C D E F	19
B-Y/R-Y	Upper bit Lower bit	0 ① 2 3 4 5 6 7 8 9 A B C D E F 0 1 2 3 4 5 6 7 8 ⑨ A B C D E F	19

Adjustment method
Caution items for each adjustment method

[Switching of the color temperature]... Switching of the color temperature between "WARM", "NORMAL", and "COOL" for each adjustment is not done even when "COLOR TEMP" of "PICTURE ADJ" or color temperature fine adjustment of "Technical" is selected. Accordingly, enter into IIC mode, press the "AV ADJ" button of the remote control, and select with the left and right cursor button to switch the color temperature.

[At the time of 1080i adjustment]

* Set to a condition where 1080i can be Input, press the "SCREEN" button on the remote control, and set the screen position to "2". Then enter into IIC mode, confirm that the on-screen adjustment item is 1080i, and perform adjustment.

[At the time of "DEF ADJ" adjustment]

... Refer to page 33.

White balance adjustment

Perform this white balance adjustment when the white or the black parts on the screen are out of balance or when the picture tube has been exchanged. Before performing white balance adjustment, est the cut-off voltage must be set, and then perform white balance adjustment.

1. Setting of the cut-off voltage

(1) Input an NTSC signal and set the aspect ratio to "FULL.

(2) Enter into IIC mode and confirm that the color temperature is "WARM". (See above for setting of WARM/NORMAL/COOL.)

(3) Select "HYBRID GAMMA" - "REAL BRIGHT" in IIC mode and fix the adjustment value to "A0". The select "HYBRID GAMMA" - "G DRIVE" and fix the "G DRIVE" adjustment value to "21".

*Setting to the above conditions facilitates the adjustment of the pedestal level (DC 170 ±5 V) in step (7).

(4) Turn the screen volume (S1) of the flyback transformer to the left, and set so that the OSD can just be seen.

(5) Enter into IIC mode and select "HYBRID GAMMA" - "G CUT OFF".

(6) Connect an oscilloscope to TPL2 (G cut-off) on the L-Board. Then press the button "⑥" on the remote control to obtain a green screen, and use the button "⑤" on the remote control to obtain one horizontal line.

Note: Use 10 key Remocon.

*Use TPL9 on the L-Board for probe earth. (There are also TPL11, L7, L8, etc.)

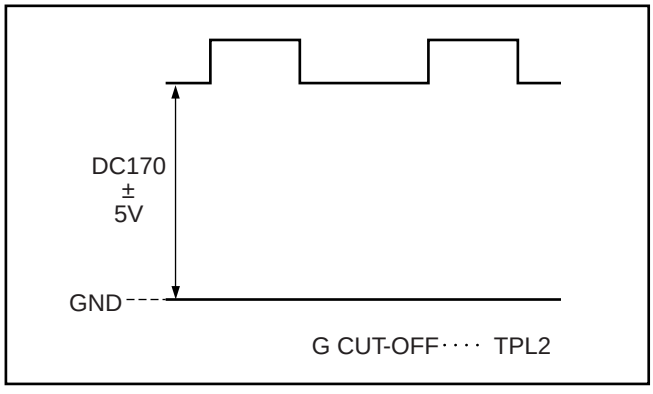
(7) When the above preparations have been made, use the Volume "+, -" buttons on the remote control to adjust so that the pedestal level of the voltage waveform becomes DC 170 ±5 V (refer to Fig. 1).

Note: Use 10 key Remocon.

(8) After completion of the adjustment, disconnect the oscilloscope, gradually increase the screen volume (S1) (clockwise turning), and fix it where green just starts to shine.

After fixing, press the button "⑤" on the remote control and cancel one horizontal line.

Fig.1 Cut-off voltage



Note: Use 10 key Remocon.

(9) To copy the adjusted G cut-off data with the same values to the NTSC color temperatures "NORMAL" and "COOL" and to the 1080i color temperatures "WARM", "NORMAL", and "COOL", enter "HYBRID GAMMA" - "G CUT OFF", and press the "NORMAL" button on the remote control for 3 seconds.

*When copying starts, the on-screen display flashes red, and the flashing stops when copying has been completed.

2. White balance adjustment

* At the time of NTSC adjustment... Input an NTSC signal and set the aspect ratio to "FULL". (-> Set "3D Y/C FILTER " to "ON" only at the time of Input of an NTSC signal.)
* Perform input paying attention to the reception method: NTSC/1080i.

(1) Select "HYBRID GAMMA" in IIC mode and confirm that the color temperature is "WARM".

(2) Look at the black parts of the presently input image and check for black floating or black unbalance.

(3) If there is black floating or black unbalance, select "HYBRID GAMMA" - "R CUT OFF", "B CUT OFF" and adjust with the "◀, ▶" buttons on the remote control. (Low-light adjustment)

*Always have the adjustment values for R cut off and B CUT OFF ready.

(4) Next, look at the white parts and check for white unbalance.

(5) If there is white unbalance, select "HYBRID GAMMA" - "R CUT OFF", "B CUT OFF" and adjust with the "◀, ▶" buttons on the remote control. (High-light adjustment)

*Always have the adjustment values for R cut-off and B cut-off ready.

(6) After completion of the adjustment, check the received image, and if there is still unbalance, adjust again according to the steps (3) to (6).

(7) Next, press the "AV ADJ" button on the remote control and set the color temperature to "NORMAL.

(8) Enter the low-light adjustment values for color temperature "NORMAL".

Input Signal / Adjustment Item	1080i	NTSC
R cut-off	+17	+5
B cut-off	+5	+9

→ Select "HYBRID GAMMA" - "R CUT OFF", "B CUT OFF", shift the adjustment value from the adjustment value at the time of color temperature "WARM" according to the table on the left, and enter the adjustment value the "◀, ▶" buttons on the remote control.
*As "G CUT OFF" is adjusted by the setting of the cut-off voltage, adjustment is not required. (NTSC/1080i)

(9) Enter the high-light adjustment values for color temperature "NORMAL".

Input Signal / Adjustment Item	1080i	NTSC
R drive	-1	+1
B drive	-8	-15

→ Select "HYBRID GAMMA" - "R DRIVE", "B DRIVE", shift the adjustment value from the adjustment value at the time of color temperature "WARM" according to the table on the left, and enter the adjustment value with the "◀, ▶" buttons on the remote control.
*As "G DRIVE" is the fixed value "21", adjustment is not required. (NTSC/1080i)

(10) Finally, press the "AV ADJ" button on the remote control and set to color temperature "COOL".

(11) Enter the low-light adjustment values and the high-light adjustment values according to the same procedure as for color temperature "NORMAL".

Input Signal / Adjustment Item	1080i	NTSC
R cut-off	+13	+8
B cut-off	+10	+16

Input Signal / Adjustment Item	1080i	NTSC
R drive	+6	+4
B drive	-22	-30

(12) After completion of the adjustment, check the image, and if there are no problems, switch off the power at the remote control (main unit) to cancel adjustment mode.

Memo

Deflection correction

When IC401 etc. on the F-Board has been exchanged and the H/V-POSITION of the picture, the amplitude, etc. is to be corrected, select "DEF ADJ" in IIC mode and adjust the deflection system. "DEF ADJ" has 14 items (sub-items of the IIC mode) and adjustment of the image details is possible for each mode/aspect.

The contents of "⑥ Adjustment methods for distortion correction" on pages 40 to 45 are mainly the adjustment contents required for use of the offset function (using the built-in cross-hatch pattern). In addition, the adjustment methods using the monoscope pattern for improvement of the adjustment accuracy also are shown.

DEF.ADJ data table

Main-Item	Sub-Item	NTSC				HDTV1080i
		FULL	NORMAL	ZOOM	JUST	
DEF.ADJ.	H-POSITION	●	● -1	●	●	○
	H-SIZE	●	● +4	●	● -1	○
	SIDE-PCC	●	●	●	●	○
	H-PARALLEL	●	●	●	●	○
	H-LINEARITY	●	×	×	×	○
	V-POSITION	●	●	●	●	○
	TRAPEZOID	●	●	● +1	●	○
	V-LINEARITY	●	●	● +1	● +2	○
	V-SIZE	●	●	● +1F	● +F	○
	PCC	●	● +1	●	●	○
	EW-CORNER·TOP	●	●	●	● +2	○
	EW-CORNER·BOTTOM	●	●	●	● +3	○
	V-S CORRECTION	●	●	●	● +F	○

* ●:NTSC "FULL" adjustment value should be adjusted.
* ○:HDTV1080i adjustment value should be adjusted.
* "x": Can not be adjusted.

1. Adjustment in NTSC "FULL" mode

(1) Input an NTSC signal and set the aspect ratio to "FULL" mode.

(2) Enter into service adjustment mode and select "DEF ADJ" in IIC mode.

(3) Press the button "⑧" on the remote control and receive the built-in cross-hatch pattern of this unit.
Note: Use 10 key Remocon

(4) First, match the center of the built-in cross-hatch pattern (center adjustment).
Select "V/H-POSITION", perform adjustment on the basis of the specified values, and match the center of the built-in cross-hatch pattern.

*In case of problems with the vertical and/or H-SIZE, select "V/H-SIZE" and adjust.

*Center adjustment (V/H-SIZE) can be speeded up by using the monoscope pattern of the unit generating the signal.

Adjustment methods (specified values)

*"V-POSITION" adjustment method → Refer to page 42.
*"H-POSITION" adjustment method → Refer to page 40.
*"V-SIZE" adjustment method → Refer to page 43.
*"H-SIZE" adjustment method → Refer to page 40.

(5) Adjust the vertical lines.
When the vertical lines of the built-in cross-hatch pattern are bow-shaped or show parallelogram distortion, select "SIDE-PCC", "H-PARALLEL, and adjust so that the distorted vertical lines become vertical to the horizontal lines.

*"SIDE-PCC" adjustment method → Refer to page 41.
*"H-PARALLEL" adjustment method → Refer to page 41.

(6) Adjust the horizontal lines.
When the interval between two neighboring horizontal lines of the built-in cross-hatch pattern is not uniform, select "V-LINEARITY", "V-S CORRECTION", "V-LINEARITY" and adjust for a good balance of the interval between the horizontal lines.

*"V-LINEARITY" adjustment method → Refer to page 42.
*"V-S CORRECTION" adjustment method → Refer to page 44.

*When "V-LINEARITY", "V-S CORRECTION" adjustment is performed, the horizontal lines of the built-in cross-hatch pattern are adjusted to the top (bottom), so that the position of the screen center changes. Accordingly, the center adjustment must be adjusted again after completion of the adjustment. (Only V-POSITION, amplitude)

(7) Perform adjustment of the H-LINEARITY.
Refer to page 41, confirm that the adjustment point of the built-in cross-hatch pattern matches the specified value, and adjust if required.

*"H-LINEARITY" adjustment method → Refer to page 41.

(8) Perform adjustment of the image geometry.
When the geometry of the built-in cross-hatch pattern shows pincushion distortion or distortion at the top or bottom, select "PCC", "EW-CORNER TOP", or "EW-CORNER BOTTOM", and adjust so that the distorted vertical lines become straight lines.

*"PCC" adjustment method → Refer to page 43.
*"EW-CORNER TOP" adjustment method → Refer to page 44.
*"EW-CORNER BOTTOM" adjustment method → Refer to page 44.

(9) After completion of adjustment, end the service adjustment mode, Input an NTSC signal in "FULL" aspect ratio, and confirm the image.

2. Adjustment in NTSC "NOMAL" mode

(1) Input an NTSC signal and set the aspect ratio to "NORMAL" mode.

(2) Enter into service adjustment mode and select the IIC mode "DEF ADJ".

(3) For "SIDE-PCC", "H-PARALLEL", "V-POSITION", "TRAPEZOID", "V-LINEARITY", "V-SIZE", "EW-CORNER・TOP", "EW-CORNER・BOTTOM", and "V-S CORRECTION", enter the same adjustment values as for the adjusted NTSC "FULL" mode with the "◀, ▶" buttons on the remote control. (Refer to page 34)

(4) Receive the built-in cross-hatch pattern of this unit, and if the image geometry shows pincushion distortion or distortion at the top or bottom, select "PCC", "EW-CORNER TOP", or "EW-CORNER BOTTOM", and adjust so that the distorted vertical lines become straight lines.

Adjustment methods (specified values)

*"PCC" adjustment method → Refer to page 43.
*"EW-CORNER TOP" adjustment method → Refer to page 44.
*"EW-CORNER BOTTOM" adjustment method → Refer to page 44.

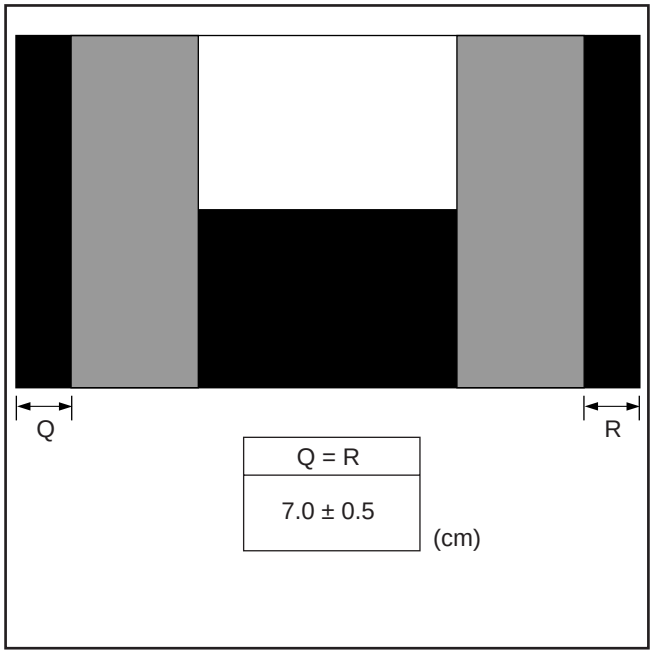
(5) Confirm the image blanking width.

(6) Place a ruler against the surface of the picture tube and measure the measuring points Q and R (refer to the figure on the right).

(7) If the measuring results show that Q or R deviates from the specified values of the figure on the right, adjust the "H-POSITION" with the "◀, ▶" buttons on the remote control so that the blanking width reaches the specified value.

*If the V-SIZE is not correct, select "V-SIZE" and perform adjustment.
(Refer to page 40 for the "V-SIZE" adjustment method.)

*Do not select "BLANKING START/END" for the effective screen and perform adjustment.



(8) After completion of the adjustment, input an NTSC signal with "NORMAL" mode for the aspect ratio and check the image.

3. Adjustment in NTSC "ZOOM" mode

(1) Input an NTSC signal and set the aspect ratio to "ZOOM" mode.

(2) Enter into service adjustment mode and select "DEF ADJ" in IIC mode.

*When entering into IIC mode, the screen position and the amplitude become standard.

(3) Press the button "⑧" of the remote control and receive a built-in cross-hatch pattern of this unit.
Note: Use 10 key Remocon.

(4) For "H-POSITION", "H-SIZE", "SIDE-PCC", "H-PARALLEL", "V-POSITION", "PCC", "EW-CORNER・TOP", "EW-CORNER・BOTTOM", and "V-S CORRECTION", enter the same adjustment values as for the adjusted NTSC "FULL" mode with the "◀, ▶" buttons on the remote control. (Refer to page 34)

(5) Check the center of the built-in cross-hatch pattern (center adjustment).
Select "V/H-POSITION", perform adjustment on the basis of the specified values, and match the center of the built-in cross-hatch pattern.

*In case of problems with the vertical and/or H-SIZE, select "V/H-SIZE" and adjust.

*Center adjustment can be speeded up by using the monoscope pattern of the unit generating the signal.

Adjustment methods (specified values)

*"V-POSITION" adjustment method → Refer to page 42.
*H-POSITION" adjustment method → Refer to page 40.
*"V-SIZE" adjustment method → Refer to page 43.

(6) Adjust the vertical lines.
When the vertical lines of the built-in cross-hatch pattern are bow-shaped or show parallelogram distortion, select "SIDE-PCC", "H-PARALLEL", and adjust so that the distorted vertical lines become vertical to the horizontal lines.

*"SIDE-PCC" adjustment method → Refer to page 41.
*"H-PARALLEL" adjustment method → Refer to page 41.

(7) Adjust the horizontal lines.
When the interval between two neighboring horizontal lines of the built-in cross-hatch pattern is not uniform, select "V-LINEARITY", "V-S CORRECTION", and adjust for a good balance of the interval between the horizontal lines.

*"V-LINEARITY" adjustment method → Refer to page 42.
*"V-S CORRECTION" adjustment method → Refer to page 44.

(8) Check the image geometry.
When the geometry of the built-in cross-hatch pattern shows pincushion distortion or distortion at the top or bottom, select "PCC", "EW-CORNER TOP", or "EW-CORNER BOTTOM", and adjust so that the distorted vertical lines become straight lines.

*"PCC" adjustment method → Refer to page 43.
*"EW-CORNER TOP" adjustment method → Refer to page 44.
*"EW-CORNER BOTTOM" adjustment method → Refer to page 44.

(9) After completion of adjustment, end the service adjustment mode, input an NTSC signal in "ZOOM" aspect ratio, and confirm the image.

4. Adjustment in NTSC "JUST" mode

(1) Input an NTSC signal and set the aspect ratio to "JUST" mode.

(2) Enter into service adjustment mode and select "DEF ADJ" in IIC mode.

(3) For "H-POSITION", "SIDE-PCC", "H-PARALLEL", "V-POSITION", "TRAPEZOID", and "PCC", enter the same adjustment values as for the adjusted NTSC "FULL" mode with the "◀, ▶" buttons on the remote control. (Refer to page 34)

(4) Press the button "⑧" on the remote control and receive the built-in cross-hatch pattern of this unit.
Note: Use 10 key Remocon.

(5) Check the center of the built-in cross-hatch pattern (center adjustment).
Select "V/H-POSITION", perform adjustment on the basis of the specified values, and match the center of the built-in cross-hatch pattern.

*In case of problems with the vertical and/or horizontal amplitude, select "V/H-SIZE" and adjust.

*Center adjustment (V/H-SIZE) can be speeded up by using the monoscope pattern of the unit generating the signal.

(6) Check the image geometry.
When the geometry of the built-in cross-hatch pattern shows pincushion distortion or distortion at the top or bottom, select "PCC", "EW-CORNER TOP", or "EW-CORNER BOTTOM", and adjust so that the distorted vertical lines become straight lines.

(7) After completion of adjustment, end the service adjustment mode, input an NTSC signal in "JUST" mode for the aspect ratio, and confirm the image.

Adjustment methods (specified values)

*"V-POSITION" adjustment method → Refer to page 42.
*"H-POSITION" adjustment method → Refer to page 40.
*"V-SIZE" adjustment method → Refer to page 43.
*"H-SIZE" adjustment method → Refer to page 40.

*"PCC" adjustment method → Refer to page 43.
*"EW-CORNER TOP" adjustment method → Refer to page 44.
*"EW-CORNER BOTTOM" adjustment method → Refer to page 44.

5. 1080i adjustment

(1) Input a 1080i.

(2) Enter into service adjustment mode and select "DEF ADJ" in IIC mode.

(3) Press the button "⑧" on the remote control and receive the built-in 1080i cross-hatch pattern of this unit.
Note: Use 10 key Remocon.

(4) First, match the center of the built-in cross-hatch pattern (center adjustment)
Select "V/H-POSITION", perform adjustment on the basis of the specified values, and match the center of the built-in cross-hatch pattern.

*In case of problems with the vertical and/or H-SIZE, select "V/H-SIZE" and adjust.

Adjustment methods (specified values)

(5) Adjust the vertical lines.
When the vertical lines of the built-in cross-hatch pattern are bow-shaped or show parallelogram distortion, select "SIDE-PCC", "H-PARALLEL", and adjust so that the distorted vertical lines become vertical to the horizontal lines.

*"V-POSITION" adjustment method → Refer to page 42.
*"H-POSITION" adjustment method → Refer to page 40.
*"V-SIZE" adjustment method → Refer to page 43.
*"H-SIZE" adjustment method → Refer to page 40.

(6) Adjust the horizontal lines.
When the interval between two neighboring horizontal lines of the built-in cross-hatch pattern is not uniform, select "V-LINEARITY", "V-S CORRECTION", and adjust for a good balance of the interval between the horizontal lines.

*"SIDE-PCC" adjustment method → Refer to page 41.
*"H-PARALLEL" adjustment method → Refer to page 41.

*When "V-LINEARITY", "V-S CORRECTION" adjustment is performed, the horizontal lines of the built-in cross-hatch pattern are adjusted to the top (bottom), so that the position of the screen center changes. Accordingly, the center adjustment must be adjusted again after completion of the adjustment. (Only V-POSITION, amplitude)

*"V-LINEARITY" adjustment method → Refer to page 42.
*"V-S CORRECTION" adjustment method → Refer to page 44.

(7) Perform adjustment of the image geometry.
When the geometry of the built-in cross-hatch pattern shows pincushion distortion or distortion at the top or bottom, select "PCC", "EW-CORNER TOP", or "EW-CORNER BOTTOM", and adjust so that the distorted vertical lines become straight lines.

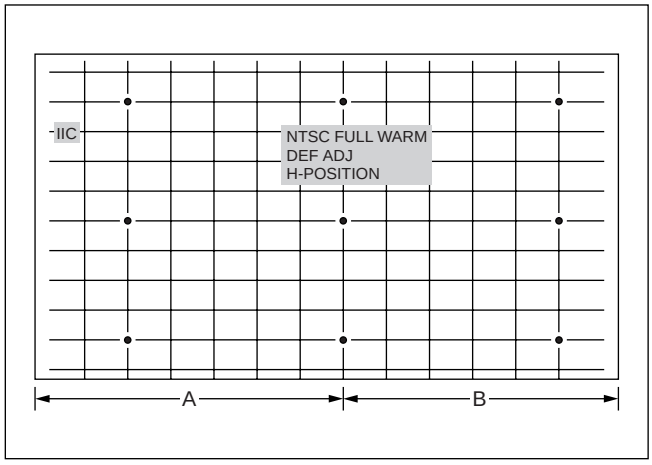
*"PCC" adjustment method → Refer to page 43.
*"EW-CORNER TOP" adjustment method → Refer to page 44.
*"EW-CORNER BOTTOM" adjustment method → Refer to page 44.

*Adjust so that the adjustment value for "EW-CORNER TOP" and "EW-CORNER BOTTOM" becomes a value from 5 to 11.

(8) After completion of adjustment, end the service adjustment mode, input a 1080i, and confirm the image.

6. Adjustment methods for distortion correction

- **"H-POSITION" adjustment**

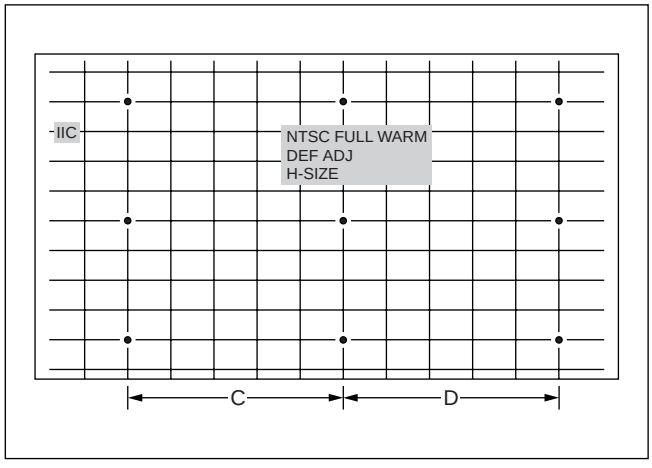


→ Press the "◀, ▶" buttons on the remote control and adjust so that the center of the vertical lines of the built-in cross-hatch pattern becomes stable at the specified value of the following table.

	A	B
NTSC FULL	395	355
1080i	380	330

(mm)

- **"H-SIZE" adjustment**

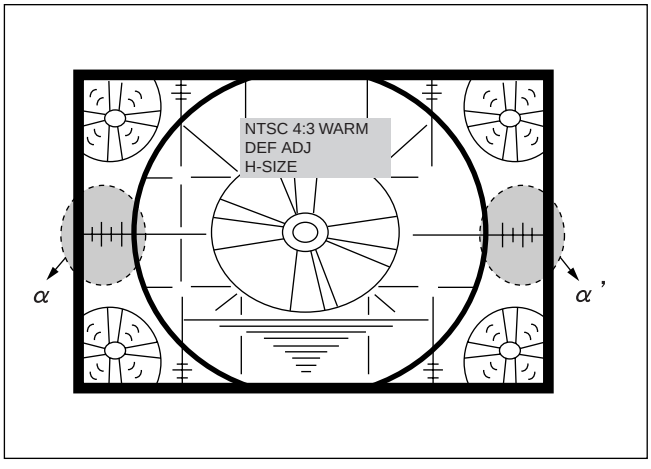


→ Press the "◀, ▶" buttons on the remote control and adjust so that the position 5 lines to the left from the center of the vertical lines of the built-in cross-hatch pattern... (C) and the position 5 lines to the right from the center... (D) becomes stable at the specified value of the following table.

	C	D
NTSC FULL	282	285
1080i	285	275

(mm)

- **When there is a monoscope pattern**

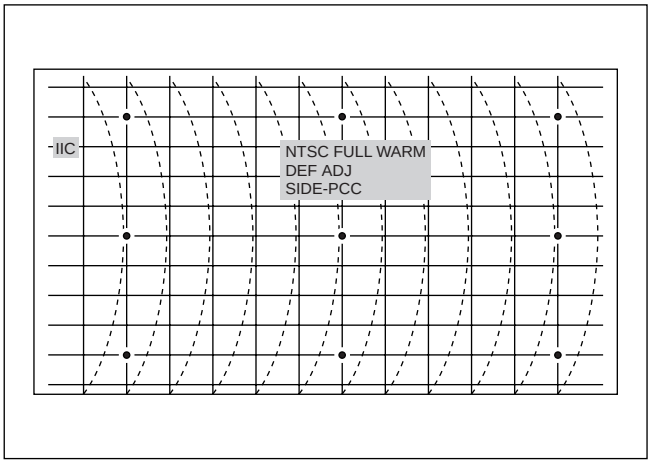


→ Press the "◀, ▶" buttons on the remote control and adjust so that the left (α and the right (α') end of the scale at the sides of the received monoscope pattern for each aspect ratio becomes stable at the specified value of the following table.

	α=α'
NTSC FULL	2.5±0.1
NTSC ZOOM	2.5±0.2
NTSC JUST	2.8±0.1

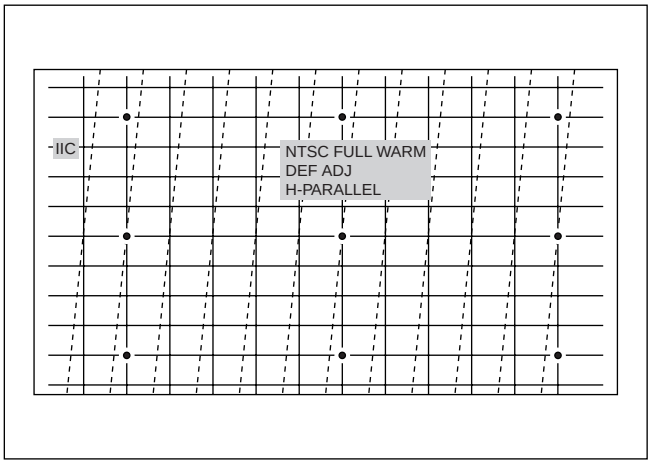
(Scale)

- **"SIDE-PCC" correction**



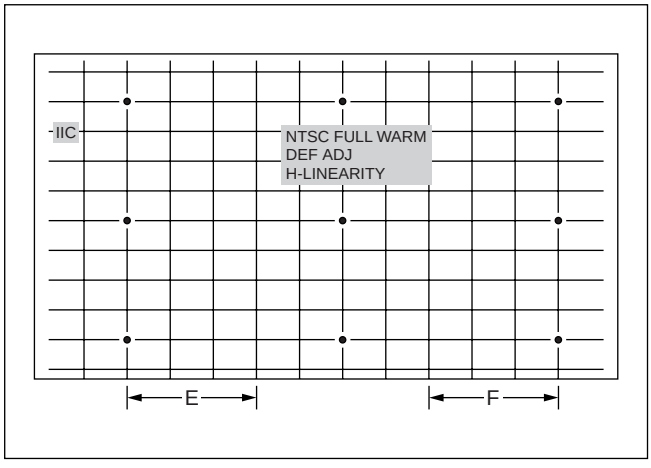
→ When the vertical lines of the built-in cross-hatch pattern show bow-shaped distortion (like the dotted lines in the figure on the left), use the center of the vertical lines as reference, press the "◀, ▶" buttons on the remote control and adjust so that the reference line becomes a straight line.

- **"H-PARALLEL" adjustment**



→ When the lines at the left and right edge have a parallelogram component (like the dotted lines in the figure on the left), use the center of the vertical lines as reference, press the "◀, ▶" buttons on the remote control and adjust so that the reference line becomes a vertical line.

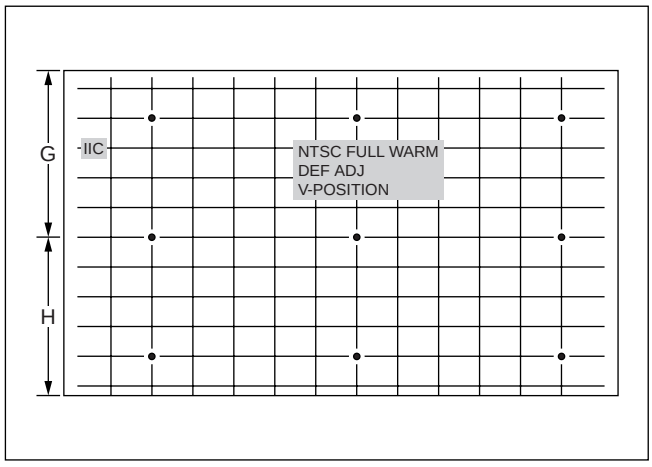
- **"H-LINEARITY" adjustment**



→ Press the "◀, ▶" buttons on the remote control and adjust so that the position 3 lines to the left from the center of the vertical lines of the built-in cross-hatch pattern... (E) and the position 3 lines to the right from the center... (F) becomes stable at the specified value of the following table.

F - E = 2 ± 5 (mm)

- **"V-POSITION" adjustment**

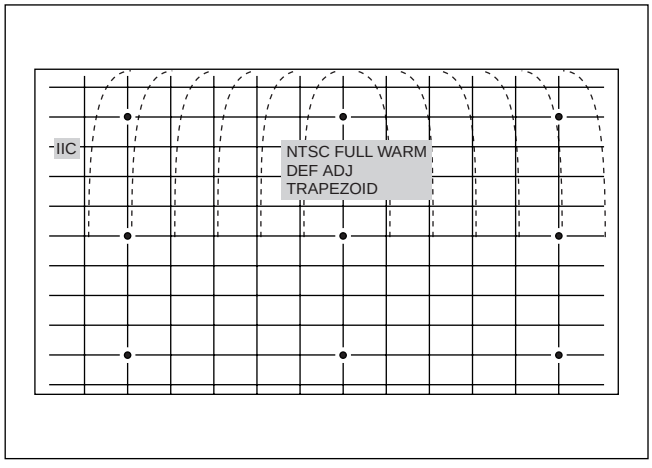


→ Press the "◀, ▶" buttons on the remote control and adjust so that the center of the horizontal lines of the built-in cross-hatch pattern becomes stable at the specified value of the following table.

	G	H
NTSC FULL	217	205
1080i	205	200

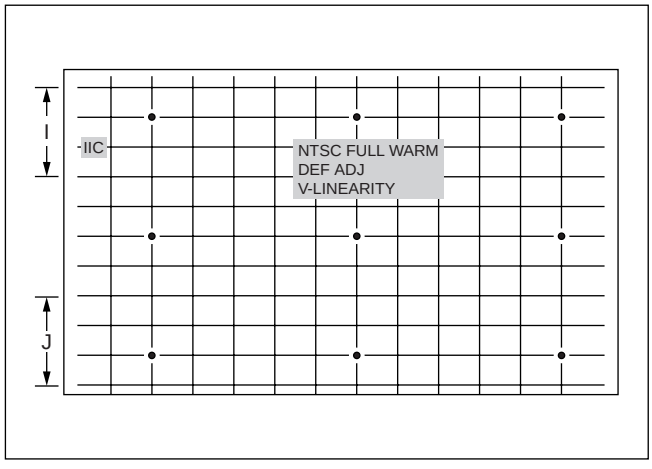
(mm)

- **"TRAPEZOID" adjustment**



→ When the vertical lines of the built-in cross-hatch pattern show trapezoidal distortion (refer to the dotted lines in the figure on the left), use the vertical lines on the outside as reference, press the "◀, ▶" buttons on the remote control and adjust so that the reference line becomes a vertical line.

- **"V-LINEARITY" adjustment**

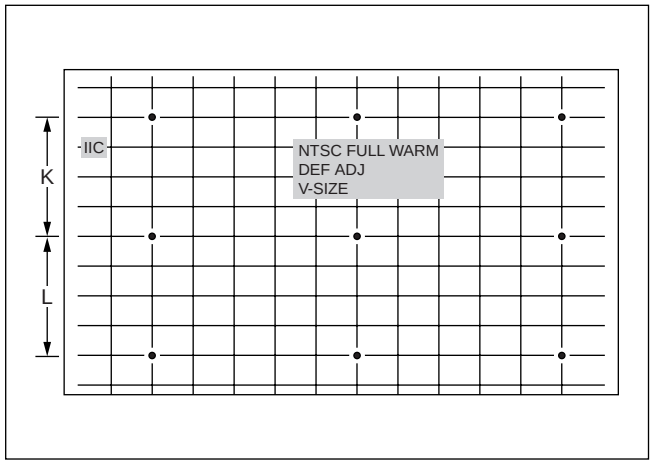


→ Press the "◀, ▶" buttons on the remote control and adjust so that the line interval between adjacent horizontal lines in the upper half and in the lower half of the built-in cross-hatch pattern becomes uniform (I = J).

*When the "V-LINEARITY" is adjusted, also adjust the "V-S CORRECTION" at the same time.

*Refer to page 44 for the "V-S CORRECTION" adjustment.

- **"V-SIZE" adjustment**

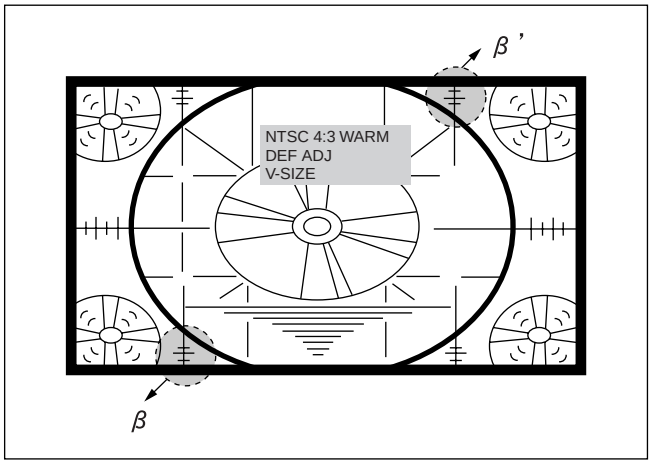


→ Press the "◀, ▶" buttons on the remote control and adjust so that the position 4 lines to the top from the center of the horizontal lines of the built-in cross-hatch pattern ... (K) and the position 4 lines to the bottom from the center... (L) becomes stable at the specified value of the following table.

	K	L
NTSC FULL	157	157
1080i	140	140

(mm)

- **When there is a monoscope pattern**

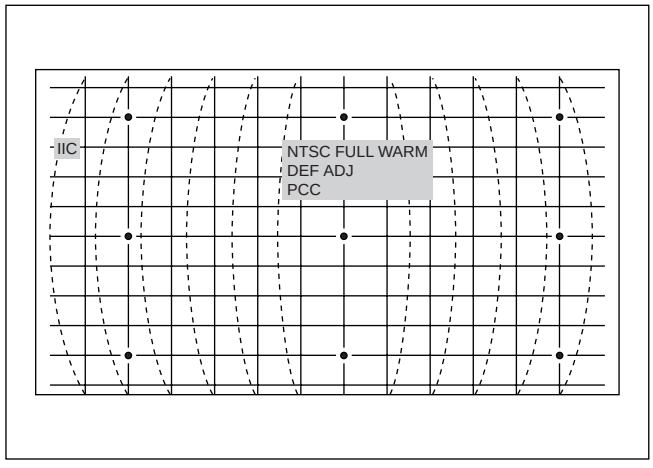


→ Press the "◀, ▶" buttons on the remote control and adjust so that the top (β) and the bottom (β') of the scale of the received monoscope pattern for each aspect ratio becomes stable at the specified value of the following table.

	β = β'
NTSC FULL	2.0±0.2
NTSC NORMAL	
NTSC JUST	1.8±0.1

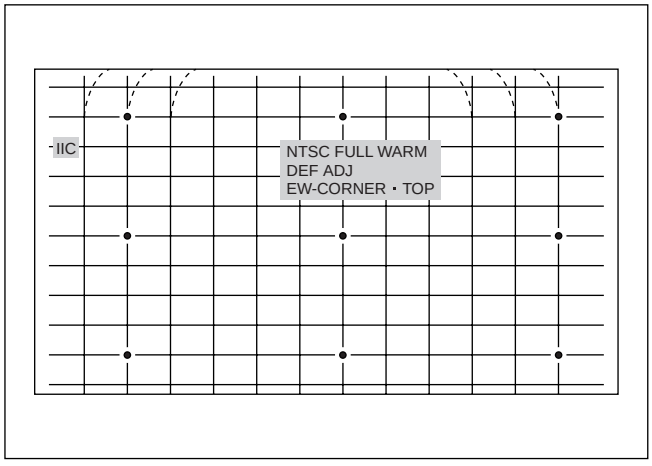
(Scale)

- **"PCC" adjustment**



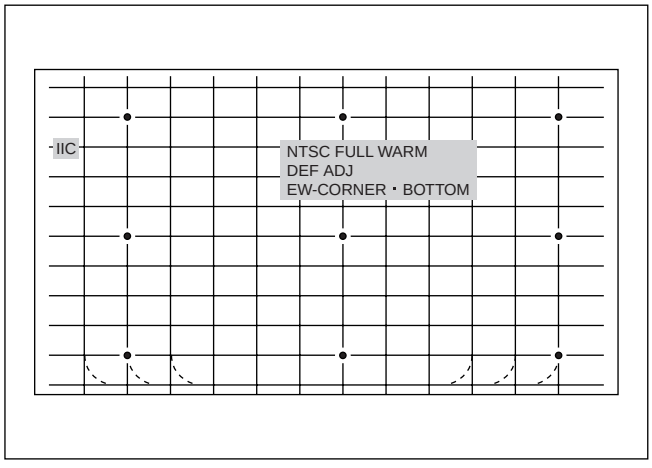
→ When the vertical lines of the built-in cross-hatch pattern show pincushion distortion (refer to the dotted lines in the figure on the left), use the first and the third line on the outside at the left and right as reference lines, press the "◀, ▶" buttons on the remote control and adjust so that the reference lines become vertical lines.

- **"EW-CORNER TOP" adjustment**



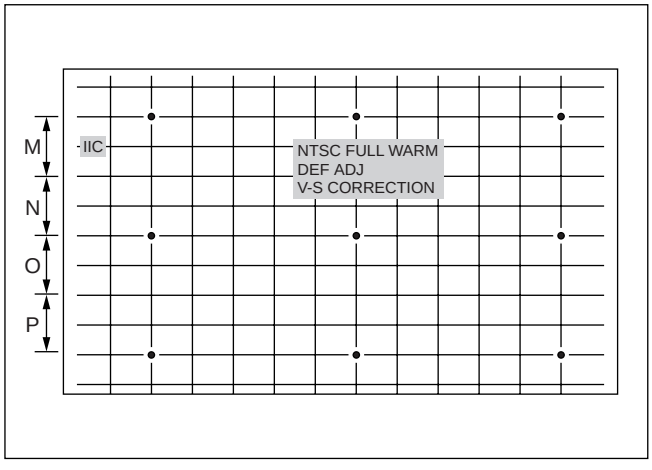
→ When the upper part of the vertical lines at the outer sides of the built-in cross-hatch pattern shows distortion at the top (refer to the dotted lines in the figure on the left), press the "◀, ▶" buttons on the remote control and adjust so that the distorted lines become vertical lines.

- **"EW-CORNER BOTTOM" adjustment**



→ When the lower part of the vertical lines at the outer sides of the built-in cross-hatch pattern shows distortion at the bottom (refer to the dotted lines in the figure on the left), press the "◀, ▶" buttons on the remote control and adjust so that the distorted lines become vertical lines.

- **"V-S CORRECTION" adjustment**

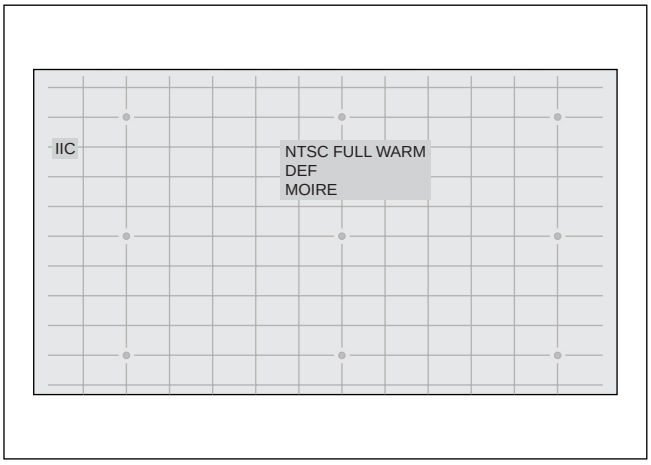


→ Press the "◀, ▶" buttons on the remote control and adjust so that the interval between adjacent lines of the built-in cross-hatch pattern become uniform at the center (N/O: Refer to the figure on the left) and at the top and the bottom (M/P: Refer to the figure on the left).

*When the "V-S CORRECTION" is adjusted, also adjust the "V-LINEARITY" at the same time.

*Refer to page 42 for the "V-LINEARITY" adjustment method.

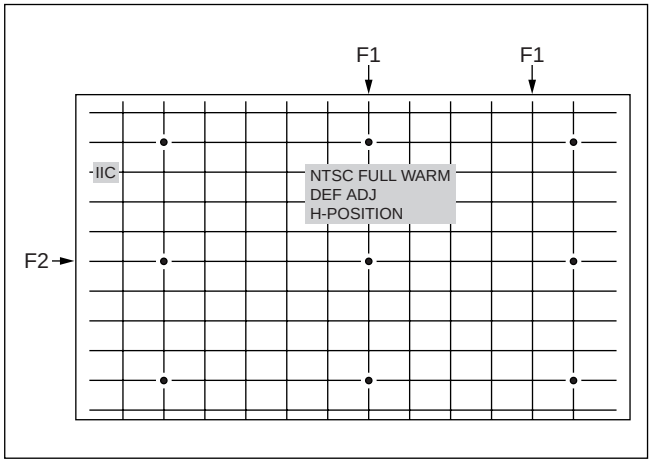
- **"MOIRE" adjustment**



→ When the "V-SIZE" is adjusted, moire may occur on the screen. In such a case, press the "◀, ▶" buttons on the remote control to reduce the moire.

→ There is no offset for the moire adjustment. When there is visible moire for the image, perform individual adjustment. (Adjustment is possible only in NTSC "FULL", "ZOOM" mode)

Focus adjustment



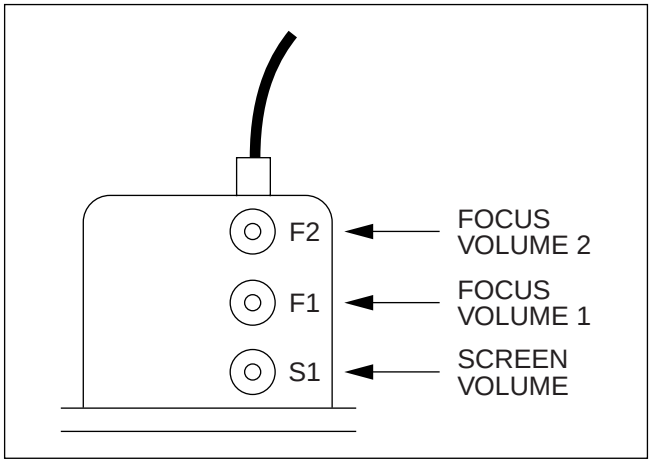
(1) Receive a 1080i.

(2) Enter into service adjustment mode and select "DEF ADJ" in IIC mode.

(3) Press the button "⑧" on the remote control and receive the built-in cross-hatch pattern of this unit.
Note: Use 10 key Remocon

(4) Adjust the F1 control of the flyback transformer so that the focus is balanced for the center line (vertical) of the cross-hatch pattern and the vertical lines two lines from the edge.

(5) Adjust the F2 control of the flyback transformer so that the center lines (horizontal) of the cross-hatch pattern are balanced well.



(6) Repeat the adjustments (4) and (5) until an optimum is obtained.

(7) Receive an NTSC signal in "FULL" mode and confirm the image.

Memo